SEPTEMBER 1956

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# World Petroleum

## INTERNATIONAL REVIEW ISSUE

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AND *Cool* nights . . .

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# *Blending Hydrocarbons for*
# Maximum Octane Potentials

By F. D. BUERSTETTA
*Ethyl Corporation, Detroit, Mich.*

The manufacture of high-octane gasolines to meet today's and tomorrow's automotive demands is putting increasing pressure on the refiner. To meet these requirements, the available hydrocarbon components in the refinery must be blended to best advantage to give maximum performance on the road.

Each octane number at the 100-octane level may cost as much as 15 to 20 cents per barrel. Thus there is a marked incentive for insuring that every laboratory octane number, obtained at this great expense, provides corresponding antiknock performance in cars on the road.

### Hydrocarbon blends studied

As part of a continuing Ethyl Research program to establish the fundamentals of laboratory versus road antiknock quality, a study was recently conducted in which the behavior of blends of pure $C_7$ and $C_8$ hydrocarbons was examined.

Within this $C_7$—$C_8$ range, the four basic hydrocarbon types—olefins, paraffins, naphthenes and aromatics—were blended in varying proportions. Actually, a mixture of iso-octane and n-heptane was used as the paraffin constituent to permit maintenance of a constant Research octane number while investigating the effects of tetraethyllead concentration and variations in hydrocarbon-type composition. Toluene, di-isobutylene and methylcyclohexane were selected to represent the aromatics, olefins and naphthenes, respectively. Each of these hydrocarbons was blended in concentrations of 20, 40, and 60 per cent by volume with the proper paraffin mixture, giving nominal Research octane levels of 92, 96 and 100 at each of four tetraethyllead concentrations—0.0, 0.5, 1.5 and 3.0 ml. per gallon.

Each blend was evaluated in single-cylinder laboratory test engines and was then rated in the 9 to 1 compression-ratio engine of a 1955 passenger car equipped with an automatic transmission. Road ratings were made by both the Modified Uniontown and Modified Borderline techniques.

### Road appreciation defined

Some of the test results are summarized in terms of road appreciation, which is the road antiknock rating of a fuel minus its Research octane number—or the bonus obtained in actual engine performance over the indicated laboratory knock rating.

The general analysis of data may permit a refiner to achieve better road performance than could be secured by using only Research octane number as a guide. It will be seen that aromatics should be maximized and olefins minimized as much as possible when making top octane fuels. Since most of today's catalytic reforming processes eliminate naphthenes through dehydrogenation to aromatics, consideration of them is somewhat academic, but nonetheless interesting.

Further evaluation of the large quantity of test data obtained from this project indicates a most interesting correlation between appreciation and the concentration of tetraethyllead. It shows that appreciation at any given sensitivity level increases with lead concentration.

**Send for your free copy** of a technical paper entitled "Octane Possibilities with $C_7$—$C_8$ Hydrocarbons" by F.D. Buerstetta and T. W. Warren. Address your request to Box 27, Ethyl Corporation, 100 Park Avenue, New York, N. Y.

### Conclusions

The general conclusions which can be obtained from the study are as follows:

**1.** Best over-all antiknock performance can be obtained by blending a high proportion of aromatics with paraffins and adding the maximum amount of tetraethyllead.

**2.** Where low-speed knock resistance is critical, high aromatic content is necessary.

**3.** Where high-speed antiknock performance is critical, high aromatic content is less important, but maximum tetraethyllead concentration is still essential.


# HOW Ethyl Research can help you

At today's high octane levels, the science of blending hydrocarbons has taken on more and more importance. As a service to the oil industry, Ethyl Research has launched a hydrocarbon blending program of its own to complement the intensive effort which the industry is devoting to this problem.

We are now testing many new blends in our laboratories and in high-compression engines on the road. Much of the data from these tests is being interpreted in terms of "road appreciation" to give refiners a better idea of the effectiveness of each blend. Write for a copy of "Octane Possibilities with $C_7$—$C_8$ Hydrocarbons"—another in the continuing series of reports from the Ethyl Corporation on fuel blending and other studies of vital interest to refiners today.

For further information, just call your Ethyl Representative. He'll be happy to arrange an appointment for you with one of our Technical Representatives.

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## *M-3 Bullet Guns Penetrate 7.175" of Casing and Cement for 30 B/D*

The operator of this shallow California well wanted to test a 35 foot upper zone that lay behind two strings of cemented casing. Interval to be perforated was from 1800' to 1835'. Casing at this point was 8⅝" O.D. 36 lb. cemented in 11¾" O.D. 54 lb. which was cemented in 15" open hole—a minimum of 7.175" of steel and cement had to be perforated if the 15" hole was exactly to gauge.

At first the operator was very sceptical that any bullet perforator would have the penetrating power to accomplish the job. However, after reviewing penetration data and performance records, he decided to use McCullough M-3 Bullet Perforators.

128 improved ½" Ogival Bullets were fired in the 35 foot zone by 4⅝" O.D. McCullough M-3 Bullet Guns. Total time on the job was only one hour and 45 minutes. Adequate penetration was accomplished without question, since 30 barrels of oil per day are being produced from the new zone—a good well for the field.

**M-3 Bullet Perforators are the original solid steel bodied bullet guns, pioneered and developed by McCullough Tool Company. Size for size they are stronger than any other bullet gun available—have greater firing power—give you deeper penetration.**

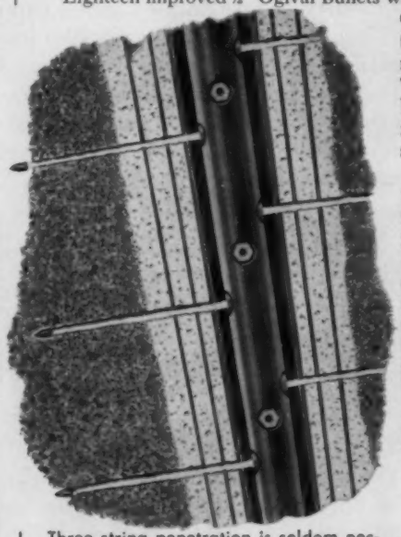
## Hardest Shooting M-3's Penetrate Three Strings For a Good Well

*Powerful M-3 Guns, Firing Improved Ogival Bullets, Penetrate Multiple String of 7", 5½" and 4½" O. D. Pipe for Good Production.*

Few perforating companies will attempt three string penetration with a bullet gun with any reasonable assurance of success. An exception to the rule is McCullough Tool Company. Recently, powerful M-3 Bullet Perforators were used to perforate a newly discovered thin zone lying behind three strings of pipe. Another service company, first offered the job, would not attempt such penetration.

This was a shallow South Texas well in which the lower productive zone proved unprofitable. The operator decided to come back up the hole and perforate a promising three foot zone at 2134 feet. At this interval 7" O.D. 24 lb. casing had been cemented in open hole. A string of 5½" O.D. 14 lb. casing had been cemented in the 7" and inside the 5½" was a 4½" O.D. liner.

Eighteen improved ½" Ogival Bullets were fired in the three foot zone by 3⅜" O.D. McCullough M-3 Bullet Perforators. Two perforating runs were made with a bailer run in between. Total time on the job, including the bailer run was two hours. Result: A fine well for the field and another satisfied McCullough customer.



Three string penetration is seldom necessary, yet it is assuring to know that McCullough M-3 Bullet Guns have the firing power needed to accomplish such a job. Even more assuring is the knowledge that, for the usual single string perforating, M-3 Guns will give you depth of penetration that cannot be equalled by any other bullet perforator.

Deep penetration is the most important single benefit to be gained from perforating. M-3 Bullet Guns have the power to penetrate one, two, or even three strings of tough casing (as in the above job); through cement sheaths and deep into the formation—far enough out into the pay zone to get the results you want—peak production, more oil!

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# Washington PIPE LINE

By Joseph B. Huttlinger

## Oil Purchases Top Billion

The purchase of petroleum products by the U. S. Department of Defense is now a billion dollar a year business. This historic mark was passed for the first time during the year that closed last June 30, it is disclosed by Captain C. G. Drescher, director of the Armed Services Petroleum Purchasing Agency.

A total of $1,059,216,465 was spent for petroleum products, much of it for aviation gasoline and aviation jet fuel. A total of 223,391,000 barrels of product was bought. Even higher spending is foreseen in the current fiscal year, with a target of 239,877,000 barrels of product to be bought. The increase is in aviation gasoline and jet fuel, with other products to stay at about the same quantities.

About 70% of the ASPPA budget goes for aviation fuel. Some $674,000,000 went for this in the last fiscal year, including $336,916,133 for jet fuels and $239,513,315 for aviation gasoline grade 115/145. Purchases of jet fuels totaled 82,455,000 barrels.

A need for 96,395,000 barrels is foreseen in the current year. Avgas purchases will rise from 44,286,000 barrels in 1955 to 47,446,000 barrels this year.

Current problems include a supply of ramjet fuel, thermally stable jet fuel and other special types, ASPPA says. Specifications have been hard to meet, and the quantities needed so small as to attract little competition in bidding. ASPPA's plan is to give widest notice to its demands for these fuels. Special Navy fuel and Avgas were in short supply on the Pacific Coast last year but all requirements were met.

## Seek Import Curbs

The day the Suez Canal crisis broke into the news, representatives of 19 U. S. crude oil producing associations, were meeting with U. S. officials to seek curbs on imports of crude, chiefly from the Middle East. A formal appeal, in writing was made after the conference and Dr. Arthur S. Flemming, defense mobilizer, promised a public hearing.

The U. S. producers insist the Suez crisis emphasizes that the free world cannot rely on Middle East oil. They will support programs to make more use of Western Hemisphere oil to meet more of the world needs.

## Praise For General White

The Senate Permanent Sub-committee on Investigations has given high praise to General W. W. White of Esso Standard Oil Co. in a report on his work as staff director of the petroleum logistics division of the Department of Defense. Mr. White, said the report, provided the "only one instance," where a high official took "real issue" with a drive for more trade with the Soviet world. If other defense officials of high rank had taken similar aggressive action to prevent decontrol, the situation undoubtedly would have been different today," it was said.

## Oil For Road Building

A total of nearly 128 million tons of bituminous material, mostly asphalt, will be needed during the next 13 years for U. S. highway construction, it is estimated by the U. S. Department of Commerce. The total of petroleum products used in construction is put at 13,280 million gallons, including gasoline, diesel oil, lubricating oil, grease and other materials.

## Nitrogen Production

Eleven petroleum companies produce nitrogen in the U. S., according to a report from the U. S. Attorney General Herbert Brownell, Jr.

Nine of the companies account for 23.2% or 852,200 tons a year of the total U. S. domestic capacity. Mr. Brownell reported with approval the entry of new firms into nitrogen. In 1951, he said, there were but three oil firms in the field.

The oil companies, some of them operating through subsidiaries, are: Phillips Petroleum Co., with 7.3% of U. S. production; Shell Oil Co., 3.7%; Union Oil Co., through Brea Chemicals, 2.3%; Sun Oil Co., Standard Oil Co. (Ohio), and Standard Oil Co. (Calif.) 2.3% each; Standard Oil Co. (Ind.) and Sinclair Refining Co., through Calumet Nitrogen, which has 2.3%; and Atlantic Refining Co., with 0.8%.

The list does not include Cities Service Oil Co. and Continental Oil Co., operating through Petroleum Chemicals, Inc., for which capacity was not available or Lion Oil Co. division of Monsanto Chemical Co.

Nitrogen expansion has been pushed by the government during the past five years on the ground it is needed for explosives and other uses, as well as for fertilizer, which takes half the output. It is used in petroleum processing, plastics, ore processing, paper production of paper rubber, textiles, chemicals and other goods.

The report of the Attorney General said 109,400 tons were used for explosives during 1954, 1,577,000 tons for fertilizer, and 14,200 tons for petroleum processing.

## Navy Land Plan Slowed

The U. S. Navy, which has been trying to arrange one of the biggest land grabs in history, to set up naval petroleum reserves, faces a go slow sign. Congress may issue a stop order in the coming year.

The matter began with the budget of President Eisenhower last January, where the Navy sought more than 500,000 to set up a naval petroleum reserve on San Nicholas Island, off the coast of California. The funds were refused, after a lively committee debate.

Later, a House Interior Committee went into the matter in detail, and made a blistering report of he Navy claims. Pursued to its ultimate, said the report, the Navy would wind up with authority, without further action of Congress, to prospect for oil, on all of the 25 million acres of real property held by the Department of Defense. In addition, the Navy would end up with the right to set up oil and gas reserves in the outer continental shelf of the U. S., where some 35 million acres are being sought by the Department of Defense.

The Navy claims are so preposterous, the report said, as to make a "built-in directive" for the Congress to enact legislation. Specifically, the committee suggested legislation that the military obtain approval of Congress whenever it wants to withdraw more than 5,000 acres of land in one package. The committee called for the Navy to limit its naval reserve operations to the lands it has, unless it asks and obtains permission from Congress to operate others.

The House of Representatives adopted the legislation at the end of the session. The Senate did not act.

## Depletion Study Planned

Congressmen are giving hints they will take a look at the depletion provisions for crude oil and natural gas production next year. For the past few years, there has been no heavy assault upon the provision, which some consider a "tax loophole." A general tax bill is expected to come up for attention next year. The Congressmen will try to lower taxes. But with spending continuing high, they will have trouble keeping a balanced budget.

Sen. James Murray, D., Mont., chairman of the Senate Interior Committee, is considering a full study of depletion for oil and gas and other minerals to see if it is too high or too low.

This autumn, a House Ways and Means Subcommittee is holding hearings into income taxes. They spill over into depletion, but it is not on the agenda. A Senate Finance Committee also is studying income taxes, with chances fifty-fifty that it will look into depletion. All the studies are spade work on next year's tax bill.

## Middle East Suez Emergency Committee

A Middle East Emergency Committee, composed of U. S. oil companies operating abroad, has been created to deal with any shortages of oil growing out of the Suez Canal crisis. The Committee will be under the voluntary agreement covering the Foreign Petroleum Supply Committee. The job of the Committee will be: (1) to arrange the "most efficient use" without regard to ownership of terminal, storage, transportation facilities of the participating companies. This might lead to a tanker pool, one source said; (2) to arrange exchanges of crude oil and products; (3) to change rates of crude oil production in foreign areas to reduce transport difficulties.

U. S. officials, meanwhile, estimate the Gulf Coast and Caribbean will be asked for 800,000 to 900,000 b/d or more crude oil in the event the Suez Canal is closed. They estimate a need for 600,000 barrels more if the Middle East pipe lines to the Mediterranean are closed, but the Canal left open. If both are closed they estimate a need for 1.1 to 1.3 million barrels daily to Europe's needs.

The Independent Petroleum Association of America, meanwhile, telegraphed Dr. Arthur S. Flemming, defense mobilizer, asking for a chance to give figures on how much more crude oil the U. S. could supply in event of need. Dr. Flemming, it was learned, plans to reply the IPAA will have a chance to give its views, but they should come in "normal" channels, to the Department of Interior.

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# Canadian Notes

## New B-A Marketing Posts

Reorganization of the marketing department of British American Oil has resulted in a number of important appointments. Responsible for B-A marketing operations in Canada is J. L. Lenker, vice president. A. E. Osborough, new general manager of marketing is responsible for all sales and operations. Six service departments, all located at head office, Toronto, have been set up. Heads of these six departments are: G. W. Garton, director of direct retail and jobber sales; L. R. Woolsey, director of direct sales; W. A. Brown, director of farm and home heating sales; R. J. Alm, director of advertising; Fulton Robinson, director of marketing research and costs; and J. R. Dawson, director of product costs and pricing.

## New Canadian Udex Plant

A contract has been awarded for a $3 million petrochemical plant at Canadian Oil's Sarnia refinery. The contract calls for the engineering and erection of a Udex plant having a design capacity of 3,650 b/d and a 4,400 b/d Platforming unit. Construction will commence this fall and completion of the new plant is scheduled for next summer. The Fluor Corp. will build the plant.

## Large Increase In Pembina Drilling

Pembina development drilling has run away with all forecasts made by operators and by Pembina Pipe Line, Ltd. Canada's largest oil field at the end of June had more than 1,200 wells capable of producing, almost the number forecast for the end of 1958 less than two years ago. Current year's completions should exceed 1,000 oil wells, have material effect on Alberta allowables.

## Opens Regina Office

James A. Smith, Jr., formerly with Ashland Oil & Refining Co., has been made a vice president for production of Woodley Canadian Oil Co. and will head a new production office the company is opening at Regina, Saskatchewan.

## New B-A Appointments

British American Oil has announced several key appointments in its manufacturing department. M. T. Stevens has been named manager of the Calgary refinery. W. E. Lundie will be manager of the Clarkson, Ontario, refinery; B. A. Barnhill manager of the Moose Jaw refinery, and C. W. Coote manager of the Edmonton refinery. Appointed as assistant managers are D. G. Berry, Clarkson refinery; R. C. Beal, Montreal East refinery; R. M. Donald, Edmonton refinery; and H. A. Hornfelt, Calgary refinery.

Mr. Coote, a graduate of the University of Alberta, joined B-A at Calgary refinery in 1944. For the past year he has been assistant manager at the company's Edmonton refinery.

O. I. Torkelsen has been appointed manager of exploration and production activities in Western Canada for British American Oil Co. This will include those operations of the recently acquired Canadian Gulf properties. Mr. Torkelsen joined B-A as a field geologist in 1939. In 1946, he was made vice president in charge of production of the western division with offices in Los Angeles. He transferred to the Toronto office in 1951 to become exploration and production coordinator. He later transferred to the Calgary office as manager of production and exploration.

## New Trans-Canada Director

T. H. Atkinson M.C., former vice president and general manager of The Royal Bank of Canada, has been elected a member of the board of Trans-Canada Pipe Lines Ltd., and appointed chairman of the company's finance committee.

## Imperial To Build Petrochemical Plant

A $25 million petrochemical plant is to be built at Imperial Oil's refinery in Sarnia and its products may feed other chemical plants which are expected to be built nearby, according to J. R. White, the company's president.

Mr. White said the expansion of the Canadian chemical industry based on the new plant could be several times larger than the plant itself. This would create new employment in the Sarnia area, and the whole country's dependence on imports of raw and finished chemicals would be lessened.

The basic chemicals to be made in quantity in the new plant, Mr. White pointed out, are ones which will be needed if the phenomenal post-war growth of the chemical industry in the U. S. is to be matched in Canada.

Engineering work on the big plant is under way now. Construction crews will move on to the site in the spring of 1957, and the plant is expected to be completed in the spring of 1958.

The plant's job will be to turn the "feed stock" which it receives from the main part of the refinery into a wide range of highly important chemicals. When these chemicals have been further processed by other firms, they will end up in consumer's hands in the form of plastic objects, antifreeze, detergents, synthetic fibres used in the new textiles, rubber objects, and gasoline additives.

Mr. White pointed out that Sarnia, already an important chemical centre, is strategically situated for further growth because it has an assured supply of western Canadian crude oil for its refineries, is near the Canadian chemical markets and on the St. Lawrence Seaway system. The location, plus the continuous supply of basic chemical raw materials which will be available from the new plant, are expected to attract new plants there, he said. Recent purchases of land adjacent to the refinery were part of the company's plans to foster the growth of allied chemical plants in Sarnia and to provide them with sites.

The basic chemicals which the new plant will make available, each in large volume, will be ethylene, propylene, normal butylenes, isobutylenes, butadiene, aromatic distillates and tars. Many other chemicals can be made available as they are needed by industry.

The butadiene from the new plant will be the first produced in Canada by a private industry. It will be supplied along with butylenes to the Polymer Corp. for use in its rubber-making operations.

## Saskatchewan Discovery Ratio Rising

The southeastern corner of Saskatchewan has become one of the world's hottest discovery regions, since the end of 1954, and discovery ratio is rising as time goes on. Cumulative discoveries in past 18 months, to end of June, 1956, amounted to 27 commercial oil wells out of 71 wildcats drilled, in 4,500-square-mile region. Ten officially defined fields are included in this list.

*Trans-Canada's gas line seems destined to reach its objective on time despite the recent U.S. steel strike. Shown is the "cradling-in" operation on the project. The 34-in. pipe is being coated and wrapped and then cradled into the 6-ft. ditch near Burstall, Sask. The line will run from Burstall to Winnipeg.*

## Sohio Appointments

Robert Duff Roberts, formerly of Oklahoma City, has been named manager of the newly-established production department office established by Sohio Petroleum Co. in Calgary, Alberta, Canada. His staff includes Dr. Rein deWit, district geologist; Nacy W. McGee, district geophysicist, and Gordon C. Christie, district landman.

## Appointed Executive Vice President

Fred H. Moore, assistant to the president, Magnolia Petroleum Co., Dallas, has been appointed executive vice president, Mobil Oil of Canada, Ltd., He will make his headquarters in Calgary. He succeeds H. R. Moorman who is being transferred to the company's general offices in New York City.

## British American Net Up in 1956

Net earnings of British American Oil Co., Ltd. for the first six months of 1956 were $10,072,000 compared with $9,805,000 in 1955.

British American officials estimated oil needs in the country will continue to rise and that Canada's annual petroleum needs by 1976 will be more than 625 million barrels, or about three times what they were last year. By 1976, according to the company, "our population could approximate 26 million; with over six million dwellings to heat; and over 9½ million motor vehicles—nearly 2½ times the present number. By 1976, petroleum and natural gas will be meeting about 68% of Canada's total energy needs. Nor must we forget that Western Canada's petroleum will have a big job in supplying the Canadian petrochemical industry."

*R. H. Clendining*

*R. C. Turner*

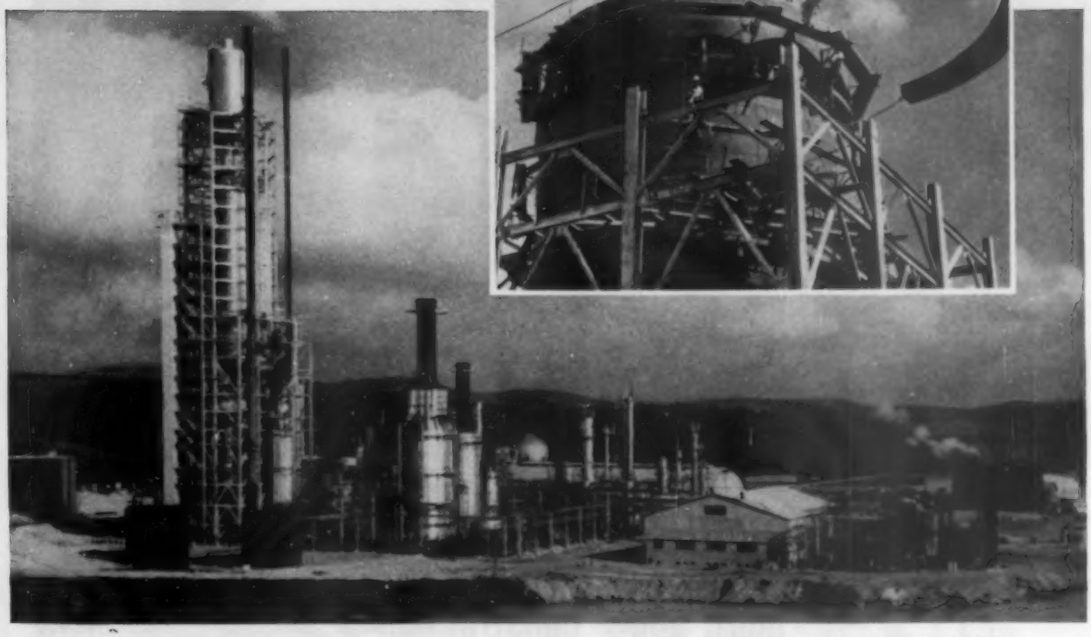
*J. F. O'Neil*

## Other British American Appointments

R. C. Turner has been appointed manager of crude supply for the British American Oil Company Ltd., located in Toronto. Mr. Turner's affiliations with British American began in 1946. In following years he was associated with both pipe line operations and crude oil purchasing. In his new position, Mr. Turner will be responsible for all crude supply in Canada. J. F. O'Neil has been appointed manager, western division of crude supply, Calgary, Alberta, with R. H. Clendining appointed assistant manager.

# 1ST TYPE 120 T.C.C. UNIT

## erected at Capuava Refinery by CB&I



Top: An air duct section for the TCC kiln being raised into place.
Bottom: General view of Capuava Refinery.

• Fourteen miles north of Sao Paulo, Brazil, at Capuava, a main fractionating tower and the *first* type 120 Thermofor unit to be built was erected by Chicago Bridge & Iron Company in cooperation with their subsidiary, Sociedade Chibridge de Construcoes, Ltda. Both of the units were fabricated at our Greenville, Pa. plant and furnished through Hydrocarbon Research, Inc., New York, for Refinaria e Exploracao de Petroleo "UNIAO" S.A. The UNIAO refinery has a crude capacity in excess of 20,000 bbls. per day and can handle a wide variety of stocks.

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So the STRIPPERMATIC was born. It's a compounded two stage pump. When the fluid is there, it pumps with a 1-1/16" displacement. When the level drops, the full 1-1/16" bore merely serves as a charging pump for the second stage annular chamber, and this is equivalent to a mere 5/8" bore pump. When this automatic shift takes place, there is a drop in load range on the sucker rods, the torque drops on the unit, and the power consumption goes down. Gas lock is eliminated by the two stage construction so both production and pump life are improved.

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# Latin American Oil News

## NWI Exports—1955

Exports of petroleum from Curacao and Aruba in 1955 are as follows (in metric tons):

| | *ARUBA* | *CURACAO* |
|---|---|---|
| Aviation components, gasoline motor | 1,692,733 | 1,604,485 |
| Kerosine & Vapoil | 1,097,004 | 455,555 |
| Gas & Diesel Oil | 3,236,292 | 2,028,854 |
| Residual Fuel Oil | 13,609,778 | 9,629,597 |
| Lube Oils | N.A. | 645,845 |
| Asphalt | 643 | 714,160 |
| Other products | N.A. | 286,297 |
| Varsel White Spirit | 5,798 | 133,056 |
| Jet Fuel | 1,142,963 | 104,679 |
| Crude | 1,455,915 | 1,204,018 |

N.A. Not Available

## 1st Quarter Venezuelan Refining Up

Refinery throughput in Venezuela rose to 54,655,000 barrels (607,278 b/d) during the first three months of this year. This includes crude oil and product intake for blending, as shown in the following table:

*1ST QUARTER VENEZUELAN REFINERY OUTPUT*
(Barrels)

| *COMPANY* | *OUTPUT* |
|---|---|
| Creole | 23,670,031 |
| Shell group | 20,989,672 |
| Sinclair | 2,530,723 |
| Texaco | 594,005 |
| Venezuela Gulf | 5,325,214 |
| Phillips | 209,055 |
| Richmond | 1,336,468 |
| TOTAL | 54,655,168 |

## Refinery Runs Down In Uruguay

Crude runs to stills in the first quarter of 1956 were 1,948,000 barrels (21,406 b/d), down slightly from the level of 23,400 b/d in 1955. Figures on runs in the 1st quarter of 1956 at the Administration Nacional de Combustibles Alcohol y Portland (ANCAP) are as follows (in barrels).

| | |
|---|---|
| Aviation gasoline | 3,717 |
| Motor fuel | 515,000 |
| Kerosine | 200,000 |
| Gas oil | 217,000 |
| Diesel oil | 101,000 |
| Fuel oil | 850,000 |
| Lube oil | — |
| Other | 33,000 |
| Losses | 29,000 |
| Total Runs to Stills | 1,948,000 bbls. |

Crude imports during the 1st quarter of 1955, were 1,437,000 barrels, received as follows (in barrels): Saudi Arabia, 122,000 bbls.; Colombia, 149,000 bbls., Venezuela, 1,166,000 bbls.

## Rising Oil Consumption In Jamaica

Figures on the consumption of oil in Jamaica, scene of an exploratory campaign at present by Stanolind, have been furnished by Esso, Shell, Texaco and Regent, the principal marketing companies. The totals are as follows (in barrels):

| | *1954* | *1955* |
|---|---|---|
| Aviation gas | 124,788 | 152,421 |
| Motor gasoline | 366,176 | 389,035 |
| Kerosine | 121,607 | 136,127 |
| Fuel oil | 1,746,603 | 1,909,958 |
| Heavy diesel | 297,094 | 243,535 |
| Light diesel | 242,132 | 295,884 |
| Motor oil | 11,280 | 10,005 |
| Industrial oil | 7,417 | 9,445 |
| Grease (330 #drums) | 3,802 | 4,142 |

## Ecuador Statistics

Company-by-company statistics on crude oil production, natural gasoline output and refinery production in Canada are set forth in recent U. S. government reports covering 1955.

The figures (in U. S. gallons) are as follows:

*ECUADOR—1955*

*PRODUCTION*

| | |
|---|---|
| Anglo-Ecuadorian Oilfields Ltd., Ancan, Guayas Province | |
| Crude oil | 105,321,594 |
| Natural gasoline from natural gas | 6,527,266 |
| | 111,848,860 |
| Ref. Products | 57,973,043 |
| Manobi Exploration Co., Cautive, Guayas Province | |
| Crude oil | 24,570,578 |
| Natural gasoline from natural gas | 437,496 |
| | 25,008,074 |
| Ref. Products | 7,677,002 |
| Carolina Oil Co., La Cardina, Guayas Province | |
| Crude oil | 16,610,664 |
| Natural gasoline since Aug. 1955 | 368,727 |
| | 16,979,391 |
| Reg. Products | 15,861,881 |
| Concepcion Ecuadorian Oilfield Ltd., Concepcion, Guayas Province | |
| Crude oil | 2,237,298 |
| Petropolis Oil Co., Petropolis, Guayas Province | |
| Crude oil | 2,415,966 |
| Ref. Products for account of Anglo-Ecuadorian | 2,210,318 |
| California Ecuador Petroleum Co., Quite—not in production | |
| TOTALS= Crude oil | 151,156,100 |
| Natural gasoline from natural gas | U.S. gallons 7,333,589 |

*REFINERY PRODUCTS*

| | |
|---|---|
| Gasoline | 27,691,578 |
| Kerosine | 8,258,981 |
| Diesel oil | 14,295,332 |
| Residual | 32,526,259 |
| Jet fuel—DEAD 2482 | 572,645 |
| Lube oils—light | 190,754 |
| Lube oils—heavy | 79,765 |
| Asphalt | 106,830 |
| | 83,722,244 |
| Grease | 19,391 |
| Exports—Crude oil | 64,139,874 |
| Imports—Products | 30,871,639 |

1955 well drilling is as follows:

| | Exploitation | Exploration |
|---|---|---|
| Anglo-Ecuadorian | 140 | 19 |
| Manabi | 36 | — |
| Carolina | 9 | 1 |
| Concepcion | 3 | — |
| | 188 | 20 |

During the year which opened April 1, 1956, plans of Anglo-Ecuadorian call for well drilling as follows: deep exploration wells, 1; deep exploitation wells, 1; shallow exploration wells, 4; shallow exploitation wells, 94. Carolina plans six exploitation wells in the year.

## New Pipeline In Ecuador Stalled

An oil pipe line extension in Ecuador, contracted for between the government and Williams Brothers of the U.S. is yet to be started, it is reported. The line is to be an extension of the Bucay-Palmira oil line to Quito and Guayaquil.

## Esso & Shell Operations In Paraguay

1955 figures for major oil products in Paraguay are as follows (cubic meters):

| | *Imports* | *Stock* | *Sales* |
|---|---|---|---|
| Gasoline | | | |
| Esso | 25,005 | 6,300 | 14,878 |
| Shell | 8,277 | 774 | 11,330 |
| Total | 33,282 | 7,074 | 26,208 |
| Diesel oil | | | |
| Esso | 8,084 | 3,000 | 4,947 |
| Shell | 1,570 | 177 | 2,530 |
| Total | 10,654 | 3,177 | 7,477 |
| Kerosine | | | |
| Esso | 5,092 | 200 | 3,740 |
| Shell | 5,183 | 333 | 4,002 |
| Total | 10,275 | 533 | 7,742 |

## Gravity Survey In Bolivia

Bolivian Gulf Oil Co. has begun an airborne magnetometer survey of 3,750,000-acres, through Aero Service Corp.

The concession area is located east of the Andes, north and east of the Camiri oil field.

## Venezuelan Crude Price Change

Creole Petroleum Corp. has increased the selling price of Tia Juana 102 low pour crude by ten cents per barrel. This increase follows the recent price rise in the U.S. Gulf for similar type lube crudes.

## Bolivia Increases Oil Operations

Crude production during 1955 increased 58.9% to 7,377 b/d during 1955. The breakdown by areas is: Camiri, 2,504,963; Sanandita, 43,901; Bermejo, 143,901; total, 2,692,765 (7.377 b/d).

Refinery production in 1955 was as follows (bbls.):

| | Runs to Stills | Avgas | Motor Fuel | Kerosine | Diesel | Fuel Oil |
|---|---|---|---|---|---|---|
| Cochabamba | 1,667,954 | 1,231 | 728,913 | 121,845 | 179,036 | 556,925 |
| Sucre | 292,446 | — | 126,250 | 16,228 | 32,642 | 111,554 |
| Camiri | 87,709 | 216 | 47,373 | 5,287 | 11,801 | 21,762 |
| Bermejo | 36,026 | — | 1,788 | 72 | 221 | 33,572 |
| Sanandita | 43,441 | — | 10,948 | 2,400 | 5,889 | 23,416 |
| Total (5,829 b/d) | 2,127,636 | 1,447 | 915,272 | 145,832 | 229,589 | 747,229 |

*Consumption of Crude & Products (bbls.)*

| | | | |
|---|---|---|---|
| Crude petroleum | 2,127,636 | Fuel oil | 633,753 |
| Motor fuel | 536,967 | Petroluem, other | 643 |
| Avgas | 99,663 | Turpentine | 5 |
| Kerosine | 148,028 | Avlube | 2,034 |
| Diesel oil | 214,658 | Solvent | 57 |
| Naphtha | 1 | | 1,635,809/bbls. |

*Exports*

| | |
|---|---|
| Crude petroleum | 476,190 bbls. |
| Motor fuel | 130,301 " |
| Kerosine | 6,636 " |
| Fuel oil | 6,309 " |
| Diesel oil | 352 " |
| | 145,598 " |

*Imports*

| | |
|---|---|
| Avgas | 122,064 bbls. |

## New Petrochemical Plant in Mexico

A new company, "Petroquimica de Mexico," will produce 31,500 tons of anhydrous ammonia annually at a plant being built at Guaymas, Sonora, it was announced by Bruno Pagliai, chairman. The enterprise, which is expected to go into production early next year, is financed by a group of top Mexican business leaders, who subscribed to 30,000,000 pesos, and an unidentified French banking firm.

In addition to Pagliai, the company's officers are Adolfo Orive Alba, general manager; Rene J. Morigeault, assistant manager; Gabriel Oropeza, resident engineer in Guaymas, and Carlos Linani, administrative secretary.

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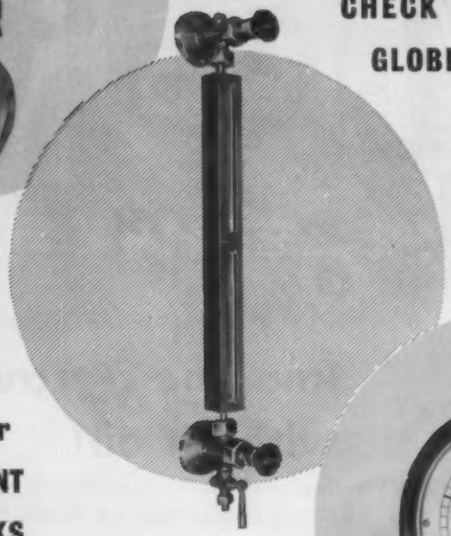

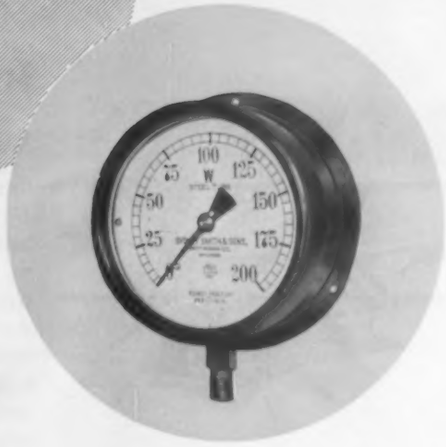

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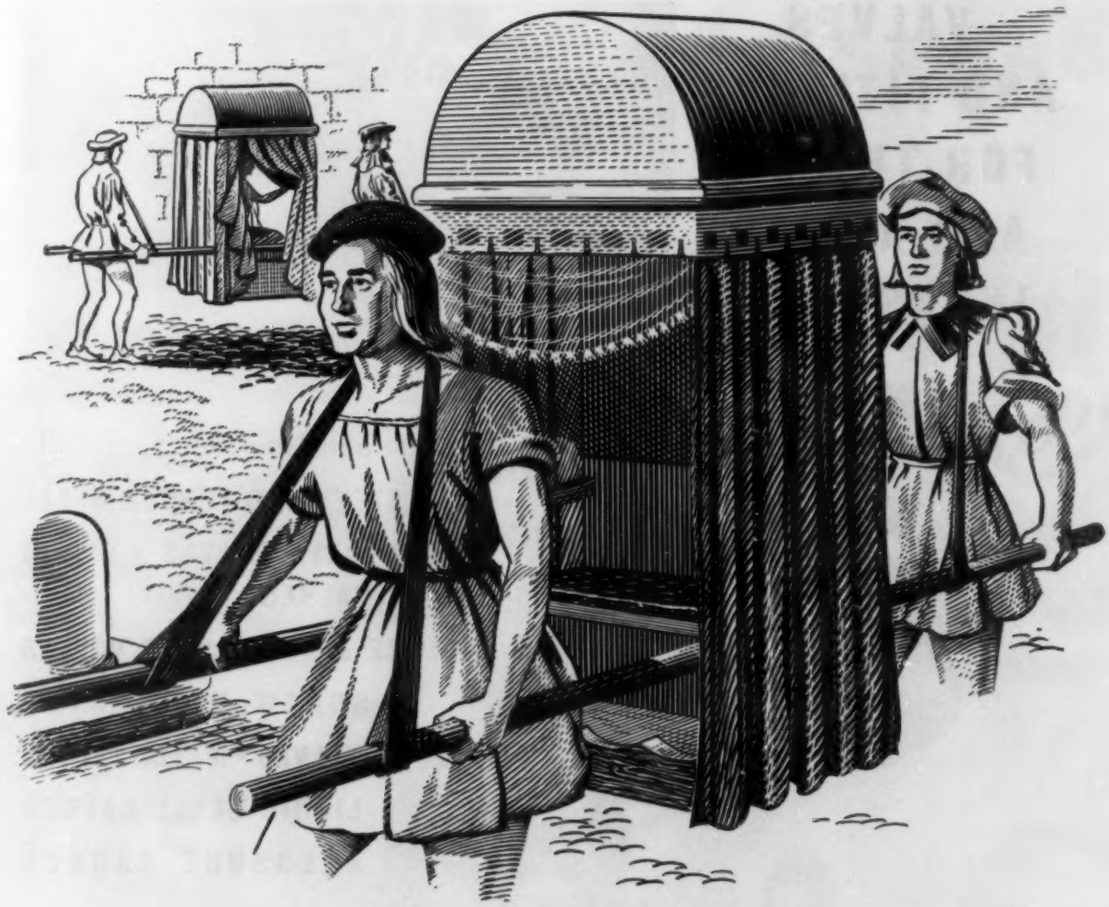

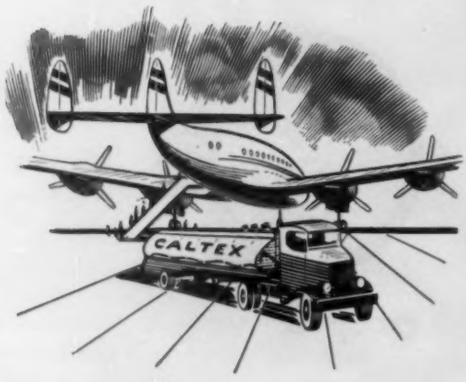


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The photograph, shows the following process units, from left to right: 41,600 bbl/day two-stage Crude Distillation unit; 13,000 bbl/day Model IV Fluid Cat Cracking unit; Light Ends Plant; 4,000 bbl/day Catalytic Polymerization unit.

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PETROLEUM CHEMICALS DIVISION

# NEWS

DU PONT

DU PONT

September ★ One of a Series of Bulletins for the Petroleum Industry ★ 1956

## Question Box

1. ARE YOU RECEIVING shipment of additives in drums in less than carload lots?
   If so, you will certainly want to read about the four-figure savings you can realize by simply revising your ordering schedule. See article at right.
2. HOW MANY different economy-grade diesel fuel problems can you lick with a single additive?
   In the article below, you may be surprised at how much one additive can accomplish for you.
3. WHO at the Du Pont Petroleum Laboratory can help you make the most efficient use of gasoline additives?
   Read about him on the next page.
4. HAVE YOU called in a doctor recently—for helping your TEL blending personnel maintain their high standards of *safe* living?
   You can find out about this unique Du Pont medical service on the next page.

## To help you overcome economy diesel fuel problems

Has the growing demand for economy diesel fuels created new problems for you? Three of the most common problems encountered by refiners are:

1. Incompatibility
2. Instability
3. Sparking tendency

Du Pont Fuel Oil Additive No. 2 (FOA-2) offers you a solution to all three.

It can help you gain the needed refining flexibility by making it possible for you to blend catalytic-cracked stocks with straight-run products, and overcome the incompatibility problem.

### Stabilizer and dispersant

In actual railroad service, the stabilizing and dispersant action of FOA-2 has proved highly effective for reducing the tendency of many economy-grade diesel fuels to cause filter-plugging and injector-sticking.

# How much can you save by ordering Du Pont additives in tank-car lots?

Refiners can save considerable money by ordering Du Pont additives in tank-car lots. For example, 4,000 gallons delivered in a tank car, rather than in drums in less than carload lots, will save the refiner between $1,680 and $2,400, as shown in this table:

| ADDITIVES | GULF COAST | | MID-CONTINENT | | WEST COAST | |
|---|---|---|---|---|---|---|
| | $ Saving | % Saving | $ Saving | % Saving | $ Saving | % Saving |
| Du Pont Antioxidant No. 22 | $2,250 | 6.7% | $2,250 | 6.7% | $2,400 | 7.0% |
| Du Pont Fuel Oil Additive No. 2 | $1,680 | 8.3% | $1,710 | 8.4% | $1,850 | 8.9% |
| Du Pont Lube Oil Additives | $1,830 | 12.0% | $1,860 | 12.0% | $2,000 | 12.5% |

Because of the difference in freight rates, the actual dollar savings vary according to the location of the refinery receiving shipment. But no matter where your refinery is located, you will find the savings decidedly worthwhile.

### How much can YOU save?

To give you the exact figures, one of our nearby representatives

OVER

Locomotive sparking, a problem which is sometimes accentuated with economy fuels, results from the formation of carbon deposits – generally during idling or while coasting downhill. The ejection of these deposits when glowing, and the resulting fire hazard, may occur during runs under heavy load.

A metallic additive is likely to aggravate this situation by increasing the size and cohesiveness of the carbon deposit particles. Field tests show, however, that an *ashless* additive does not contribute to the sparking problem. Rather, it tends to minimize it.

Du Pont FOA-2, therefore, being an *ashless*, nonmetallic additive, can help you reduce any sparking tendency in economy-grade diesel fuels.

*ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)*

DU PONT

# PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

CONTINUED *Tank-car lots*

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## LABORATORY GROUP HEAD

In number of miles, the distance between Havertown, Pennsylvania and Wilmington, Delaware is not far, unless, as Harold Scheule did, you go by way of Bartlesville, Oklahoma.

Scheule, who is supervisor of the Gasoline and TEL Group at the Petroleum Laboratory, was born in Havertown in 1921. Following his graduation from Bucknell University in 1943, with a B.S. in Chemical Engineering and a Phi Beta Kappa key, Harold joined the Bartlesville staff of Phillips Petroleum Company, where he remained until 1946. Since then he's been with Du Pont at the Petroleum Laboratory.

His professional affiliations include membership in the American Institute of Chemical Engineers and the American Chemical Society. He is also active in the Coordinating Research Council.

**HAROLD J. SCHEULE**

## Du Pont medical representatives teach safety as a way of life

Hurrying back and forth across the country, and traveling overseas, too, Dr. Stewart L. Rankin covers more than 50,000 miles a year. In the course of his travels, he has firmly impressed upon more than 20,000 refinery workers his famous slogan, "Safety is a way of life!"

**DR. RANKIN** is shown at right with Doctors Fenton Russell (left) and L. A. Gerlach, all of the Du Pont Medical Division.

His talks on safety are part of a unique medical service which Du Pont, as a supplier of tetraethyl lead, makes available to the oil industry. In addition to the talks, Dr. Rankin and his medical associates work closely with refinery managements, physicians, supervisors and blenders to help them maintain the very finest health and hygiene programs. Practicing *preventive* medicine, the Du Pont doctors will tell you emphatically that their greatest ambition is that they *never* have to treat a case of lead poisoning.

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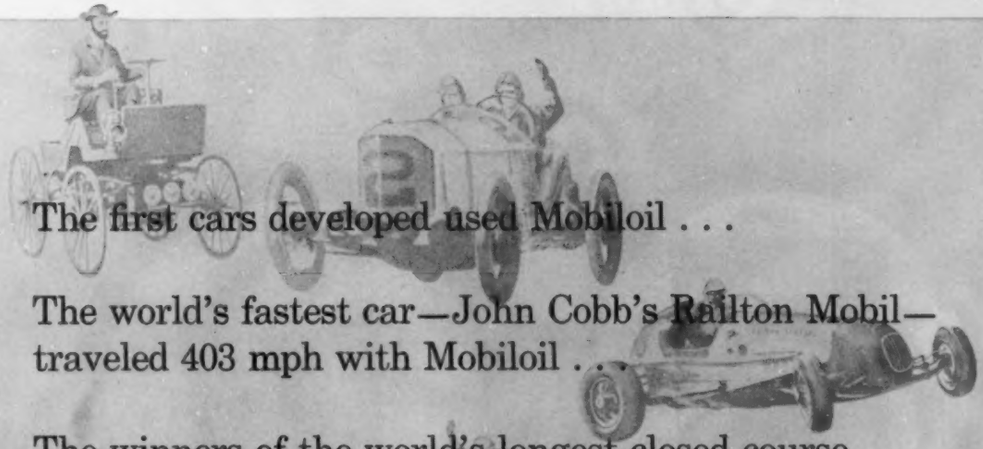
*Trademark registration applied for.

# It's no Coincidence...



The first cars developed used Mobiloil . . .

The world's fastest car—John Cobb's Railton Mobil—traveled 403 mph with Mobiloil . . .

The winners of the world's longest closed course race—the Indianapolis 500—for the last five years in a row used Mobiloil . . .

The winners, for year after year, of the world's steepest uphill race, the Pike's Peak Hill Climb . . . the world's longest, toughest road race—the 1900-mile Pan American Race . . . the holders of major stock car records coast-to-coast—all used Mobiloil . . .

Yes, it's no coincidence, today more automobiles in the United States and throughout the world use Mobiloil than any other brand.

*Mobil Pays Off—in Progress, Performance and Protection*

**SOCONY MOBIL OIL COMPANY, INC.**

and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

*Reproduced above is the standard form upon which we schedule plant and the appropriate balanced assembly of gland packings for each item of plant.*

**By far the most important factor in the cost of a gland packing is its life in service.**

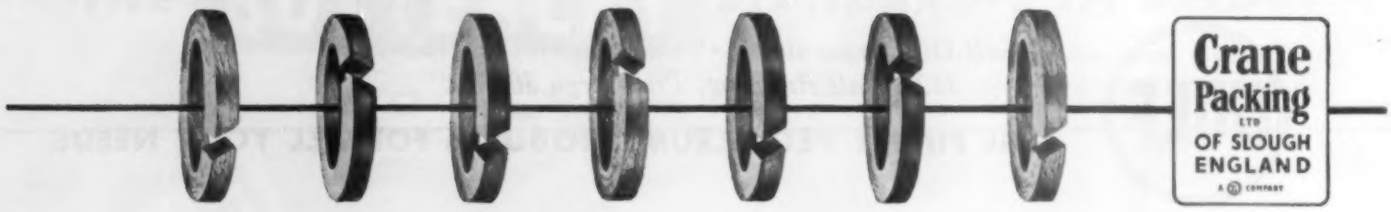
Over 30 years experience as specialist manufacturers of gland packings has proved to us that often it is impracticable to get the best results by using a single type of packing in the gland of a pump, compressor or similar type of plant.

In such instances, a balanced assembly of die-formed rings of gland packing, based upon the nature of the service conditions and upon the type of plant in which it is to be used, is both more efficient and cheaper in the long run.

We will supply you with balanced assemblies, packed ready for installation, and we recommend that you allow us to schedule for you a list of plant and the assembly of packings we recommend for each item. Stocks of balanced assemblies of gland packings are generally organised on the imprest system.

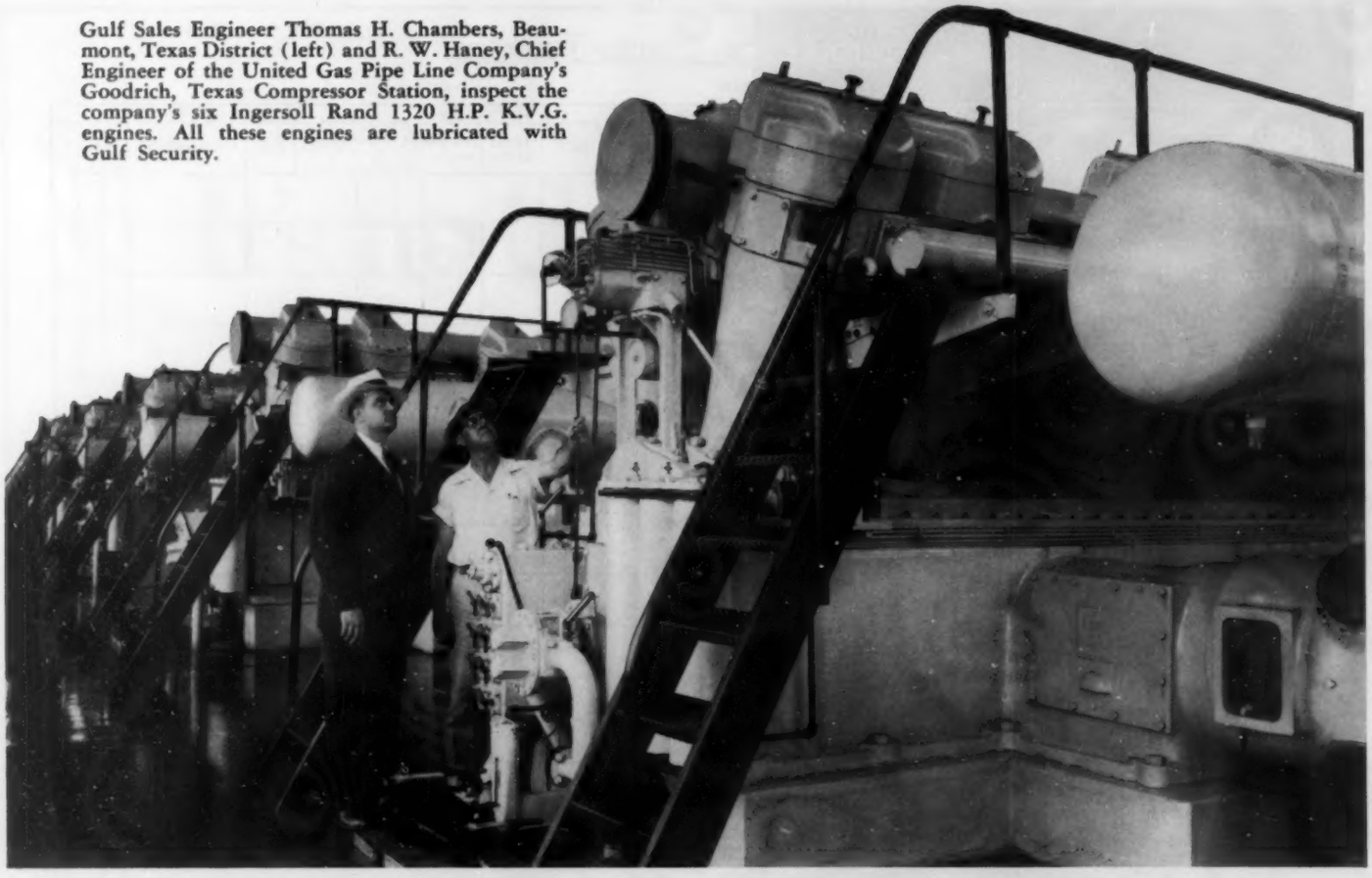
This is the most systematic, efficient and economical way of buying gland packings for all services, and we should welcome the opportunity of discussing with you your special requirements.

*These rings of packing illustrate a specimen 7-ring balanced assembly. For the purpose of this illustration, the diagonal joints of the rings are shown located in two positions. In practice, there should be three positions approximating to 12, 4 and 8 o'clock.*



## *balanced assemblies of gland packings by* Crane Packing LTD.

Crane Packing LTD OF SLOUGH ENGLAND A COMPANY



Gulf Sales Engineer Thomas H. Chambers, Beaumont, Texas District (left) and R. W. Haney, Chief Engineer of the United Gas Pipe Line Company's Goodrich, Texas Compressor Station, inspect the company's six Ingersoll Rand 1320 H.P. K.V.G. engines. All these engines are lubricated with Gulf Security.

# *Lock out high maintenance costs in your gas transmission plants*

# *with* GULF SECURITY

Gulf Security's outstanding record in the lubrication of pipeline gas engine compressor units is your assurance of smooth, continuous operation. In scores of gas transmission plants this high quality straight mineral oil helps prevent operating troubles and contributes to low maintenance costs.

Gulf Security is a non-additive oil that does not cloud liquid filled lubricators of power cylinders, compressor cylinders, and packing glands. After years of operation with Gulf Security, cylinders and piston rings of both compressors and power assemblies show negligible wear, and its excellent oxidation stability helps prevent the formation of acid and resins in the crankcase system.

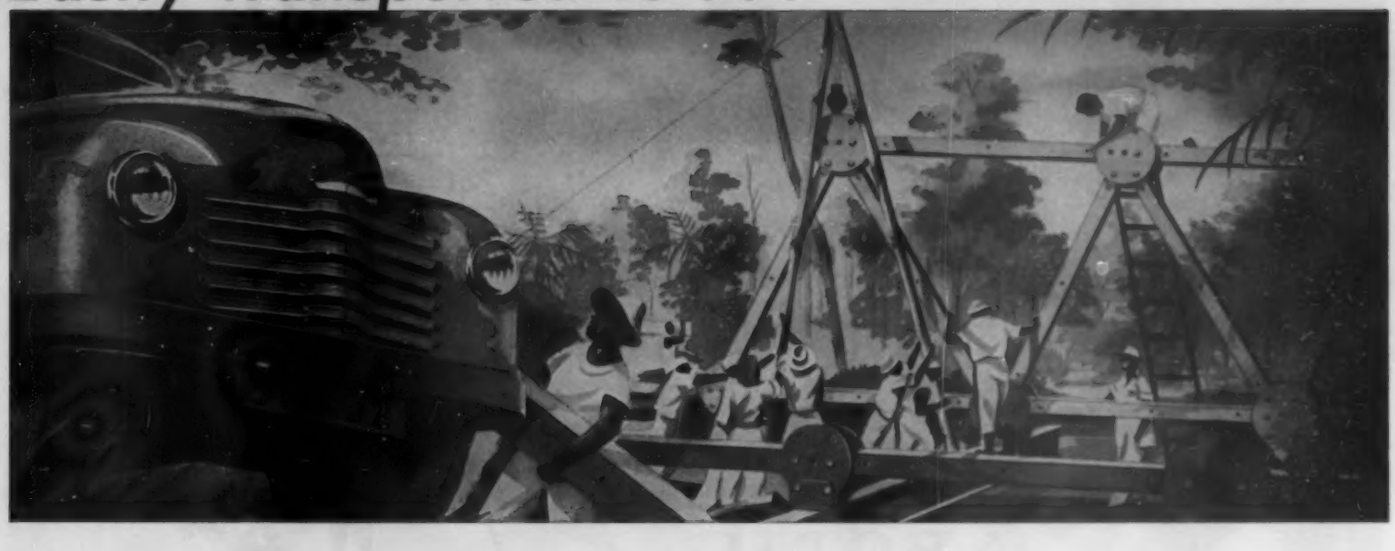
Make certain your units receive safe, effective lubrication protection—specify Gulf Security. And remember that Gulf provides the services of a trained, experienced petroleum expert—the Gulf Sales Engineer—to help you with any problem involving a petroleum product. Consult the telephone directory for the number of your nearest Gulf office.

GULF

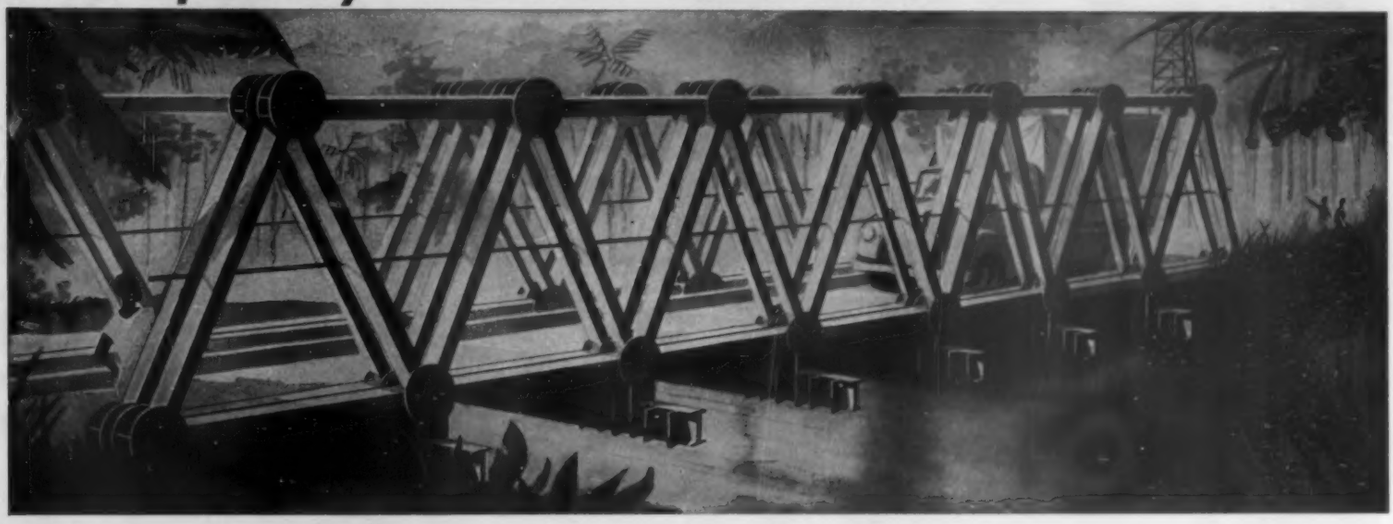
*Gulf Oil Corporation • Gulf Refining Company*
*1822 Gulf Building, Pittsburgh 30, Pa.*

**THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS**

# *Easily transported to . . .*

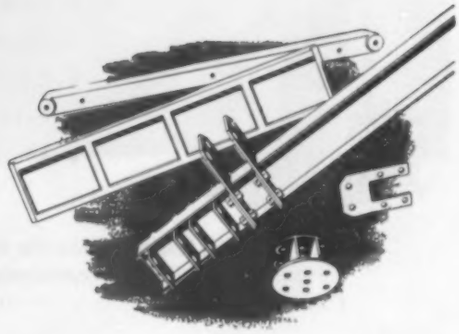


# *and quickly erected on . . .*



# *remote up-country sites*

Butterley Standard-Unit Bridges are in use all over the world where transport is difficult, skilled labour scarce or where site preparation has to be carried out under adverse conditions. From five standard units, all sizes of bridges can be built; the units can be sent by any form of transport; site erection is remarkably simple and swift with an absolute minimum of equipment.



**THE BUTTERLEY STANDARD-UNIT BRIDGE**

THE BUTTERLEY COMPANY LIMITED RIPLEY DERBY ENGLAND

*London Office:* 9 UPPER BELGRAVE STREET S.W.1.

# FROM THE ARCTIC CIRCLE

# to the tropics...

from Europe to Asia, anywhere oil is refined, you'll find BORN Heaters on the job.

It may be a mighty BORN "UPFLO®" HEATER, a Born "PreFab" (preassembled, prefabricated) a "Vertiflo" or "Pariflo." Whatever the model, it was chosen because the customer wanted the right heater for the job. Every BORN heater is individually suited to the customer's requirements, yet every Born heater gives you:

- **Low first cost**
- **High fuel efficiencies**
- **Close control**
- **Economical, trouble-free operation**
- **Many exclusive safety features**

*For full information on* BORN *Heaters, write your nearest* BORN *representative or the home office.*

**BORN Engineering Company**

Manufacturers of Direct-Fired "UPFLO" Heaters

TULSA, OKLAHOMA

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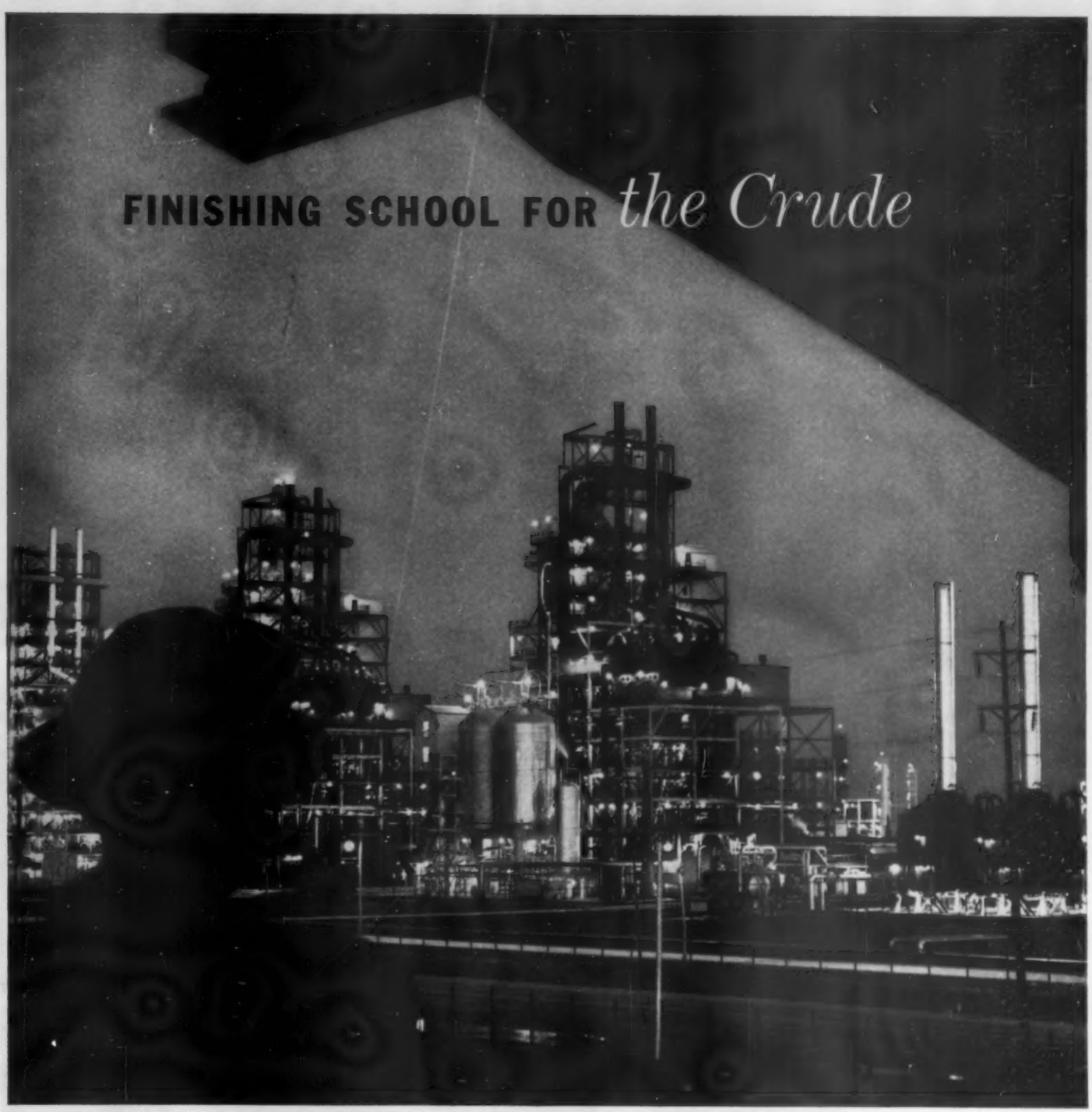



The crude oil that enters the four giant Cities Service refineries such as this, graduates into over 400 different Cities Service products . . . each as fine and improved as the ultramodern facilities that make them.

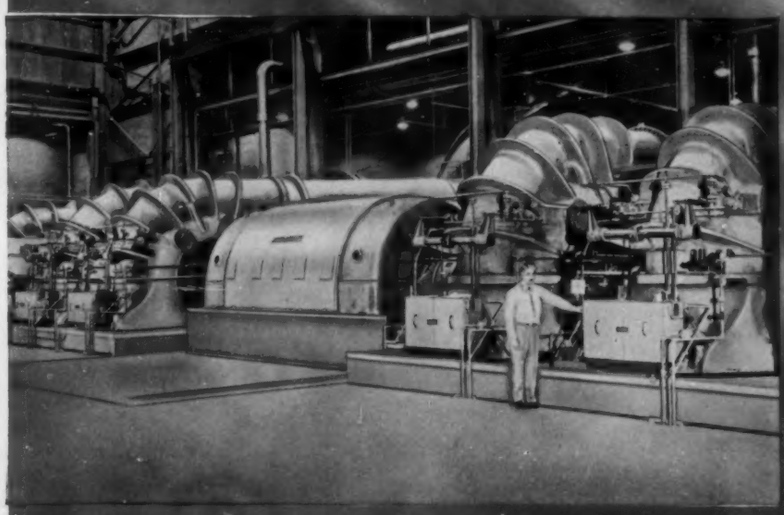
Here, then, is one of the big reasons why sales of Cities Service products have soared to an all-time high!

But it is far from the *only* reason. For this huge sales increase represents a dynamic expansion now under way in all phases of Cities Service operation: exploration, production, refining, marketing, and research. The fact is, there's nowhere that Cities Service isn't expanding!

And the end result of this bustling activity? You'll be seeing it soon in new and better petroleum products, new and bigger sales records for Cities Service . . . a leader in petroleum progress.

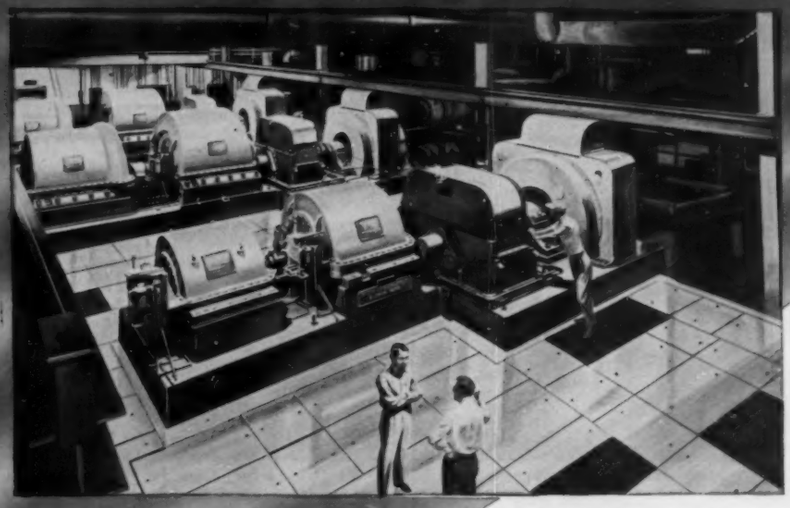
CITIES SERVICE

*Progress through Service*



Five R-C single-stage centrifugal blowers developing over 1,000,000 cfm direct driven from electric motors rated at more than 80,000 HP at Langley Field, Virginia.

Six R-C multi-stage blowers rated over 75,000 cfm requiring about 14,000 HP, part of a centrifugal installation at Lewis Flight Propulsion Laboratory in Cleveland.



*Roots-Connersville creates*

# STOP-AND-GO WHIRLWINDS FOR AIRCRAFT RESEARCH

Man-made air masses that match the violence of nature's hurricanes pour from the Roots-Connersville Blowers at the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics. Yet the power of these huge wind-making machines can be instantly controlled, from a soft, whispering breeze to a roaring, whirling cyclone. In the reverse, the siphoning air movement can develop almost perfect vacuums to simulate the air conditions of high altitudes. A similar but larger N.A.C.A. "wind-making system" is now being completed at Langley Field, Virginia.

The same engineering and manufacturing abilities that developed these stop-and-go whirlwinds are applied by Roots-Connersville to the everyday movement of gas and air, in small or large quantities, for industry. Now in its second century of service, Roots-Connersville Blower Division, one of the Dresser Industries, builds the world's most extensive and varied line of such equipment.

**Teamwork...that serves the world!**

In its specialized field, each Dresser company, operating independently, has the experience, facilities and engineering manpower to meet the progressive needs of the industries it serves. Whenever an unusually challenging problem is put before any Dresser operating unit, the vast research, engineering and production facilities of all divisions of Dresser Industries, Inc. can be swiftly mobilized into effective teamwork. Throughout the oil, gas, chemical, electronic and other industries, this coordinated performance is known as the Dresser *Plus-f*...a standard of comparison the world over. *Briefacts* gives the complete story of the Dresser *Plus-f* Write for your copy today.

Tomorrow's progress planned today

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BUS TRANSPORTATION is big business in the U. S. today. Millions of American travelers have found it safe, comfortable, punctual, dependable. Over the years, the men who manage America's bus lines have worked hard to bring their industry to this high degree of efficiency. And we of The Texas Company are proud that so many of them have called on our specialized skills to help them. In fact . . .

*More chassis, wheel bearings, transmissions and differentials of buses in the United States are lubricated with Texaco Products than with any other brand.*

TEXACO

**THE TEXAS COMPANY**

# When you invest your dollars *for the big holes...*

...specify National Seamless Oil Country Tubular Products. In oil fields throughout the world you'll find USS NATIONAL Seamless Drill Pipe, Casing and Tubing constantly on the job, safeguarding production, rough and ready to be worked hard, and ready to meet the higher stresses of drilling deeper holes tomorrow.

These NATIONAL Seamless Oil Country Tubular Products are known the world over for their outstanding service record in deep-well work. The secret of their strength and dependability may be attributed to two things—quality steel and a unique method of manufacture. Each seamless tube is pierced from a solid billet of steel. And only steel of the very best forging properties and of the highest uniformity can be used, since the piercing operation tends to search out any defects in the metal.

Thus, NATIONAL Seamless Oil Country Tubular Products are built to take the worst that oil-well drilling has to offer—*built to give you more service and better service for every dollar you invest.* Remember *that*—the next time you order drill pipe, casing, or tubing.

## Some significant developments

**NATIONAL DEOXIDIZED BESSEMER STEEL CASING AND TUBING — GRADES H-40, J-55**

Especially well-suited for oil production because of its combination of high yield strength and good ductility.

**NATIONAL WARM-WORKED CASING — GRADE N-80**

An extremely high-strength casing possessing a uniformity of physical properties which gives it high collapse resistance and greatly increased joint strength. It is hydrostatically tested to 80% of minimum yield strength up to a maximum of 10,000 psi.

**NATIONAL DEEP-WELL CASING**

A stronger casing than is provided under A.P.I. specifications, to meet constantly increasing depths. Due to the severe service for which it is intended, it is hydrostatically tested to 80% minimum yield strength up to a maximum of 12,000 psi.

**NATIONAL B BUTTRESS-THREAD CASING**

Developed to satisfy the need for a casing joint which will safely and economically support the weight of deep-well casing. The buttress-thread joint is comparable in strength to that of the body of the pipe.

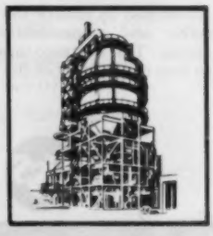
USS *Look for this trademark . . . your guide to quality steel*

**UNITED STATES STEEL EXPORT COMPANY**
30 CHURCH STREET, NEW YORK 8, U. S. A.

# ONE SOURCE *for all Three*

ENGINEERING

MATERIALS



ERECTION SERVICE

If you are revamping or adding to the capacity of cat crackers, oil stills or heaters—you'll do better if you get a quote from Bigelow-Liptak on the refractories for the vessel or heat enclosures.

Why? Because B-L supplies all of the *three* elements which must be considered—engineering, materials, erection help.

Jobs are handled by engineers who *know* every facet of the problem at hand—men who have had years of experience with refractories and oil refinery problems. Materials used have been proven on countless installations under the most severe of abrasive or high temperature conditions. And erection is performed by a crew of men who specialize in refinery work . . . not only in the United States, but all over the world.

All in all, you can't miss. Cost? Less than you might think—particularly in the long run. Write today!

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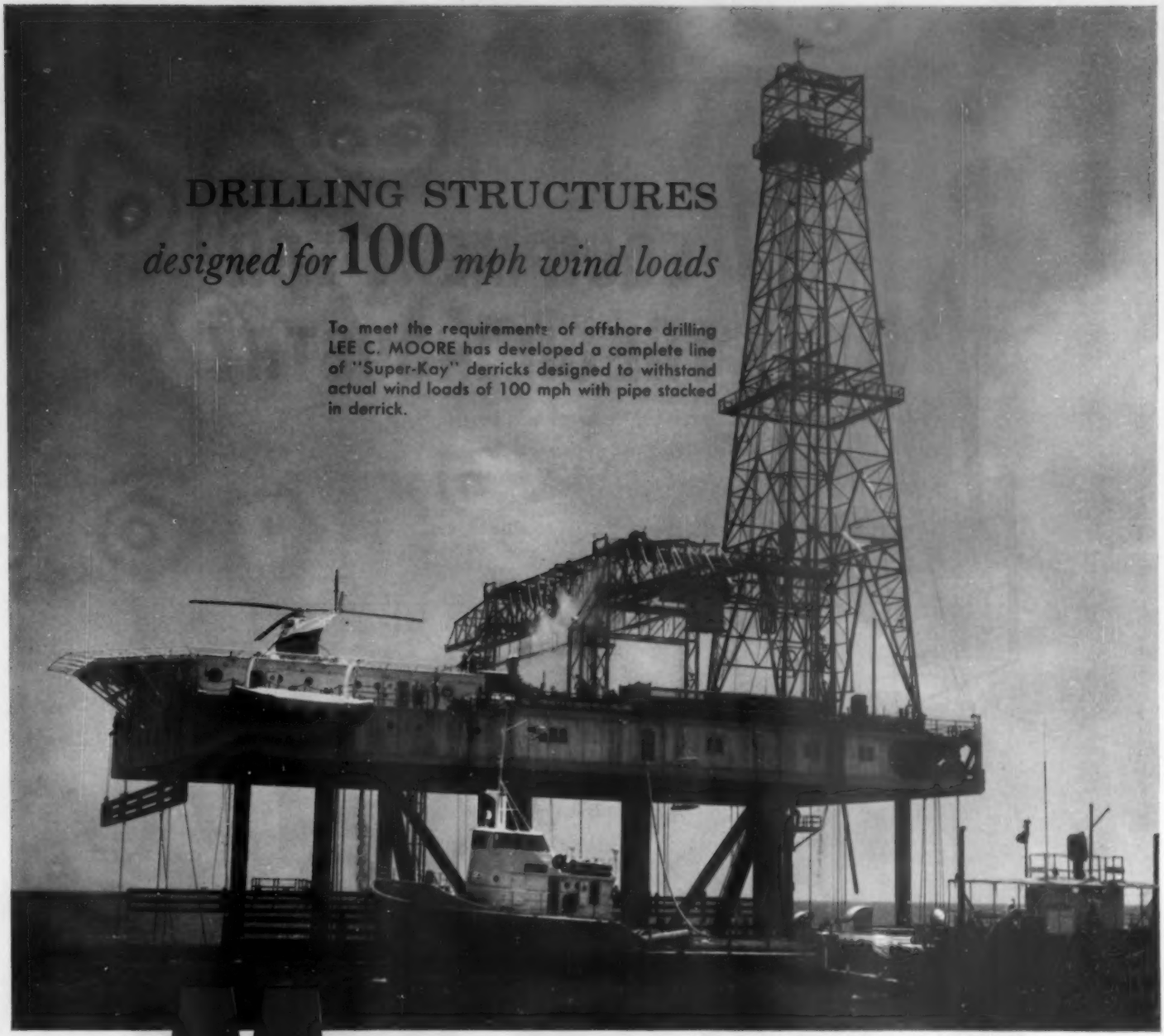

# DRILLING STRUCTURES
## *designed for* 100 *mph wind loads*

To meet the requirements of offshore drilling LEE C. MOORE has developed a complete line of "Super-Kay" derricks designed to withstand actual wind loads of 100 mph with pipe stacked in derrick.

Four wells are drilled from this 140′ LEE C. MOORE SUPER-KAY derrick by shifting the crown, rotary and racking platform.

LEE C.

# Moore

CORPORATION

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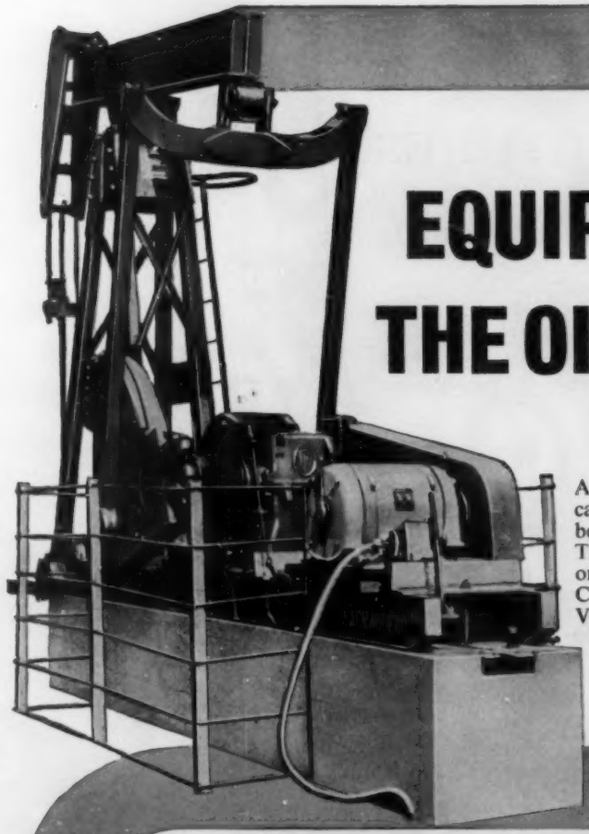
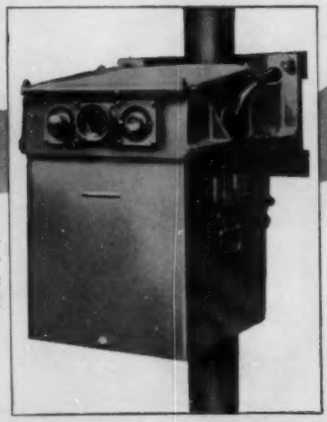
EXPORT OFFICE: Room 624, International Bldg., 630 5th Ave., New York 20, New York

FOREIGN LICENSED MFR.; Oil Well Engineering Co., Ltd., Cheadle Heath, Stockport, England

# EQUIPMENT FOR THE OIL INDUSTRY

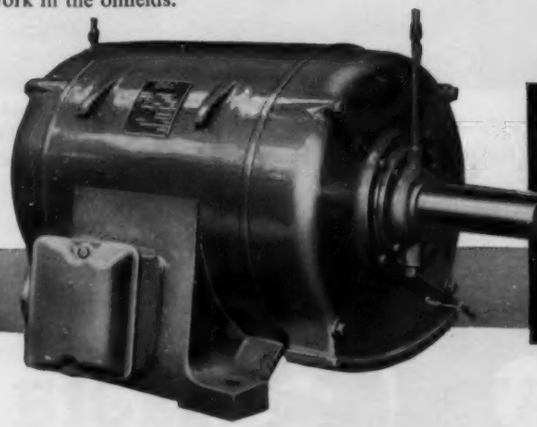


A high torque squirrel cage motor driving a beam type well pump. This installation is on one of the oilfields of Compania Shell de Venezuela.



A combined circuit breaker and contactor starter for the automatic control of oilwell motors.

A G.E.C. weatherproof motor designed and built for arduous work in the oilfields.



BY G.E.C.

THE GENERAL ELECTRIC CO. LTD. OF ENGLAND

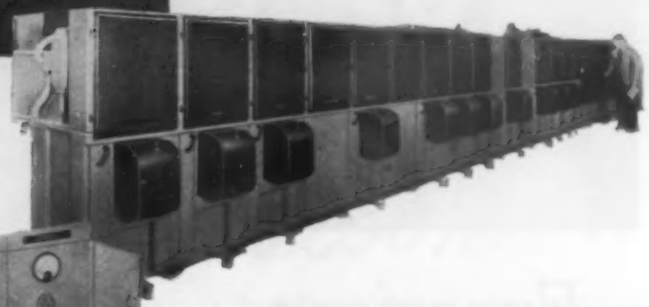
# METALCLAD SWITCHGEAR

## and remote control panels

## for Oil Refineries

The Burmah-Shell Refineries Ltd. specified BTH 22-kV and 6.6-kV metalclad switchgear for their new Bombay Refinery.

Five-panel, 22-kV, 500-MVA solenoid-operated switchboard for the control of the incoming feeders (from the Tata Power Co., Ltd.) and 7,500-kVA transformers which supply electric power to the whole refinery.



Twenty-panel, 6.6-kV, 250-MVA solenoid-operated switchboard controlling the 7,500-kVA transformers and main refinery feeders.

Control and relay panels with mimic diagrams for 6.6-kV switchboard.

Manufacture is now proceeding with a further two 22-kV, and nine 6.6-kV, units for a third 7,500-kVA transformer and additional refinery feeders; BTH have also supplied a total of eighty-three 6.6-kV, 150-MVA hand-operated metal-clad switchgear equipments for the refinery substations.

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# SAVE THOUSANDS OF BARRELS OF OIL YEARLY

## WITH *Microballoon** Phenolic Spheres For EVAPORATION CONTROL

***A 9.6 mm. LAYER REDUCED EVAPORATION BY 11,800 BARRELS a year in this tank farm!***

*(Capacity of farm is 400 thousand bbls.)*

The installation paid for itself in a matter of months and continues to pay big dividends after more than two years—without additional investment.

***TEAR OUT THIS CARD FOR***

*Trade-mark of The Standard Oil Co. (Ohio)

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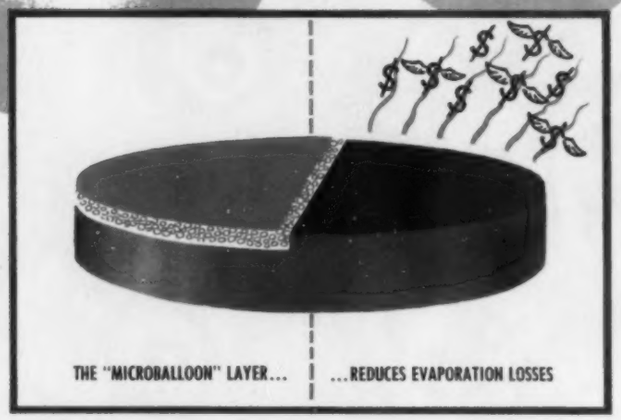
# The FLOATING BLANKET
## That Seals Against Evaporation

"Microballoon" spheres for evaporation control are actually microscopic spheres of phenolic plastic, filled with a sealed-in gas. A thin layer of millions of "Microballoon" phenolic spheres cuts off evaporation like a "floating blanket".

"Microballoon" spheres are non-abrading, won't harm tanks, pipes or pumping equipment.

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A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N.Y., U.S.A.
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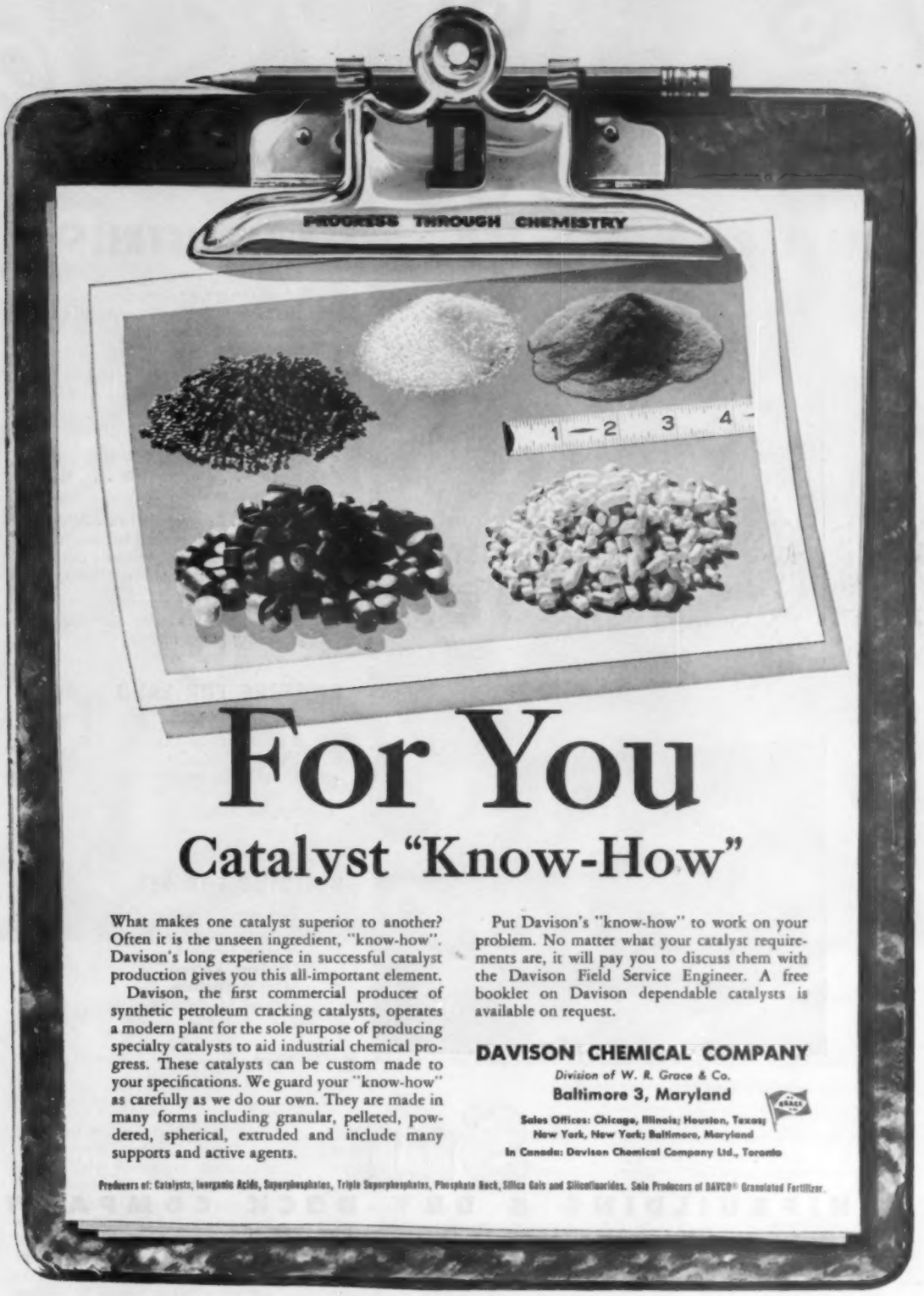


# For You

## Catalyst "Know-How"

What makes one catalyst superior to another? Often it is the unseen ingredient, "know-how". Davison's long experience in successful catalyst production gives you this all-important element.

Davison, the first commercial producer of synthetic petroleum cracking catalysts, operates a modern plant for the sole purpose of producing specialty catalysts to aid industrial chemical progress. These catalysts can be custom made to your specifications. We guard your "know-how" as carefully as we do our own. They are made in many forms including granular, pelleted, powdered, spherical, extruded and include many supports and active agents.

Put Davison's "know-how" to work on your problem. No matter what your catalyst requirements are, it will pay you to discuss them with the Davison Field Service Engineer. A free booklet on Davison dependable catalysts is available on request.

**DAVISON CHEMICAL COMPANY**

*Division of W. R. Grace & Co.*

**Baltimore 3, Maryland**

**Sales Offices: Chicago, Illinois; Houston, Texas; New York, New York; Baltimore, Maryland**

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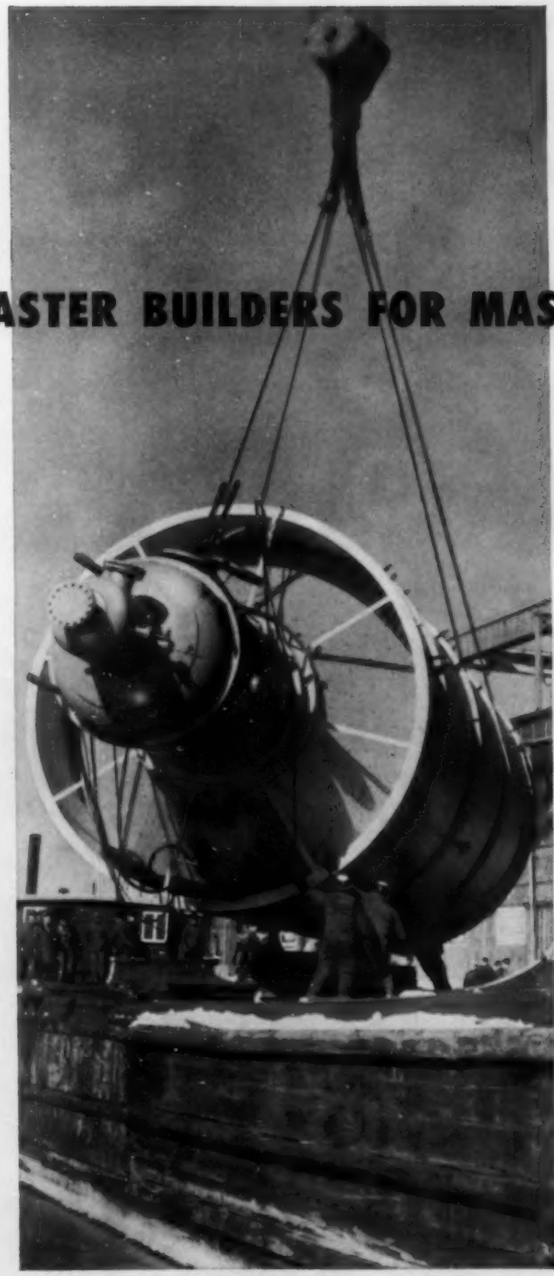
**Producers of: Catalysts, Inorganic Acids, Superphosphates, Triple Superphosphates, Phosphate Rock, Silica Gels and Silicofluorides. Sole Producers of DAVCO® Granulated Fertilizer.**



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For forty years, engineering leaders in the oil-refining and chemical industries have been calling upon Sun Ship for service and they find—

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- Facilities and craft skills that can produce . . . and deliver . . . the equipment needed—swiftly;
- A special . . . segregated . . . Alloy Products Shop equipped to produce medium and heavy stainless alloy and aluminum products for industry.

*You are invited to discuss any current plans or problems with our Sales Engineering Department.*

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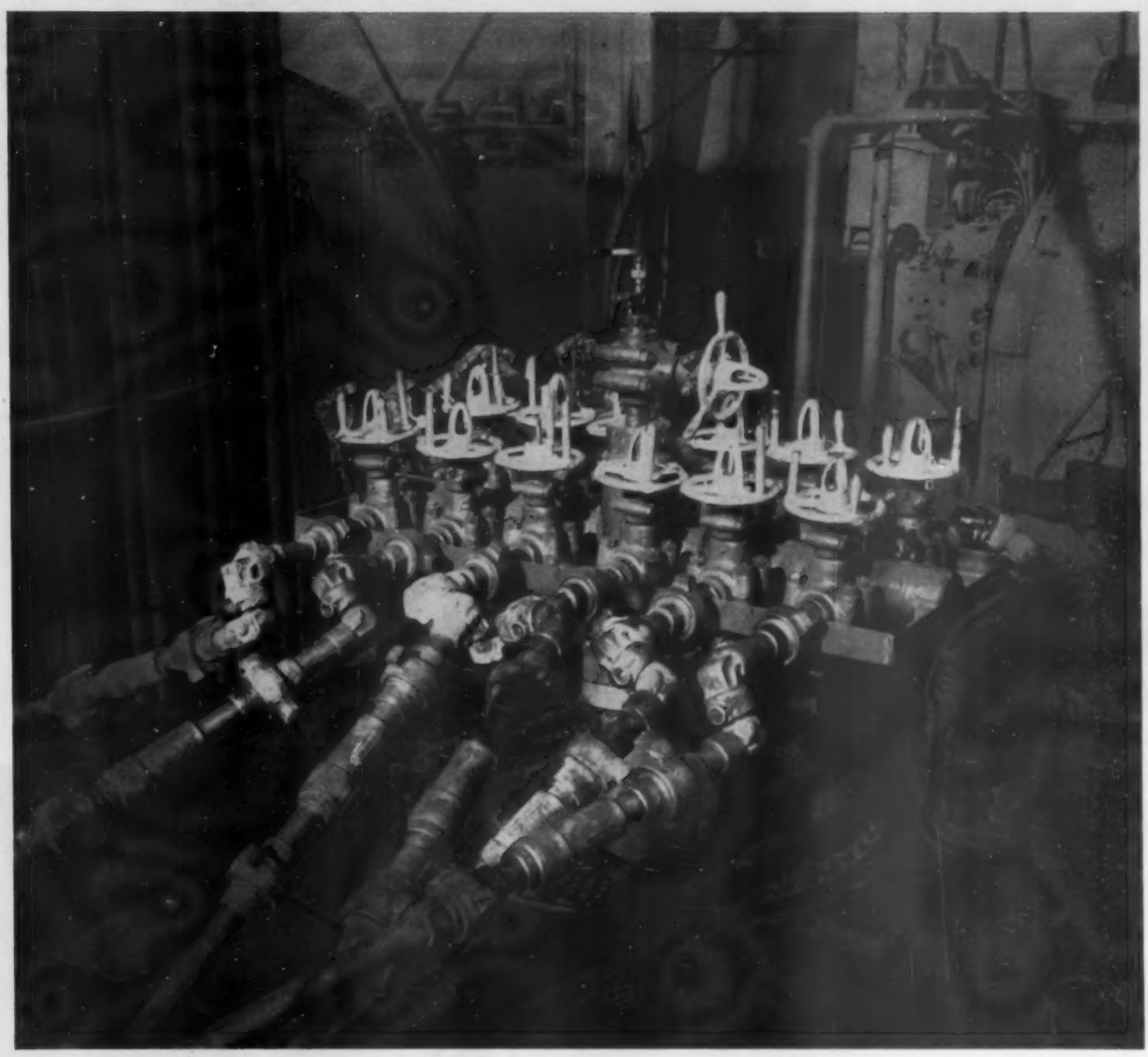

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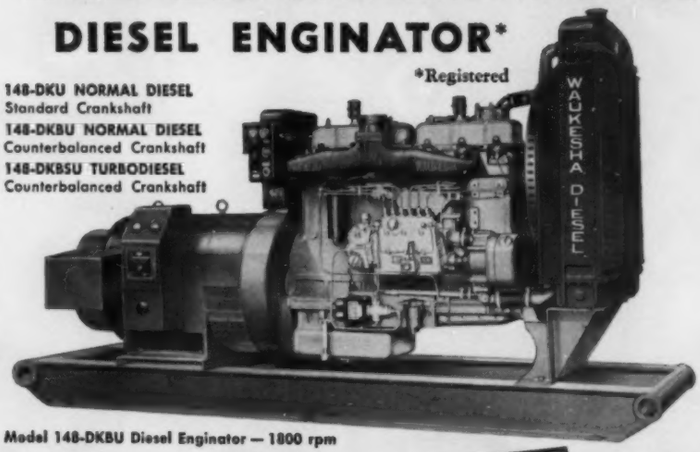


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**1917** World War I—powered the first "Liberty" army truck

**1921** Combustion chamber and fuels research began

**1923** Introduced internal combustion engines in oil fields

**1924** Waukesha cylinder head design transforms industry

**1926** Diesel engine research begins

**1931** Waukesha ignition oil engine introduced

**1935** First propane-engined railway air conditioning

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**1941** Millions of horsepower for all armed services

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**1952** Application of turbo-charging to high speed Diesels

**1953** New Laboratory and Research Center

**1954** Introduction of 12-cylinder gas and diesel engines

**1955** Diesel-Icer systems for refrigerator cars

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**148 SERIES DIESEL ENGINATOR CAPACITIES**—KILOWATTS**

| GENERATOR MODEL (by rpm rating) | ENGINE MODELS 148-DKU, 148-DKBU, 148-DKBSU | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | STAND-BY KW | | | INTERMITTENT KW | | | CONTINUOUS KW | | |
| | 148-DKU | 148-DKBU | 148-DKBSU | 148-DKU | 148-DKBU | 148-DKBSU | 148-DKU | 148-DKBU | 148-DKBSU |
| 1800 | * | 115 | 150 | * | 100 | 135 | * | 90 | 120 |
| 1200 | 85 | 85 | † | 80 | 80 | † | 70 | 70 | † |
| 900 | 65 | 65 | † | 60 | 60 | † | 50 | 50 | † |

*148-DKU cannot be operated at 1800 rpm.
**Ratings are corrected to standard conditions 29.92 Hg. Barometer and 60° F. Air Temperature.
†Model 148-DKBSU not practical to operate at 900 and 1200 rpm.

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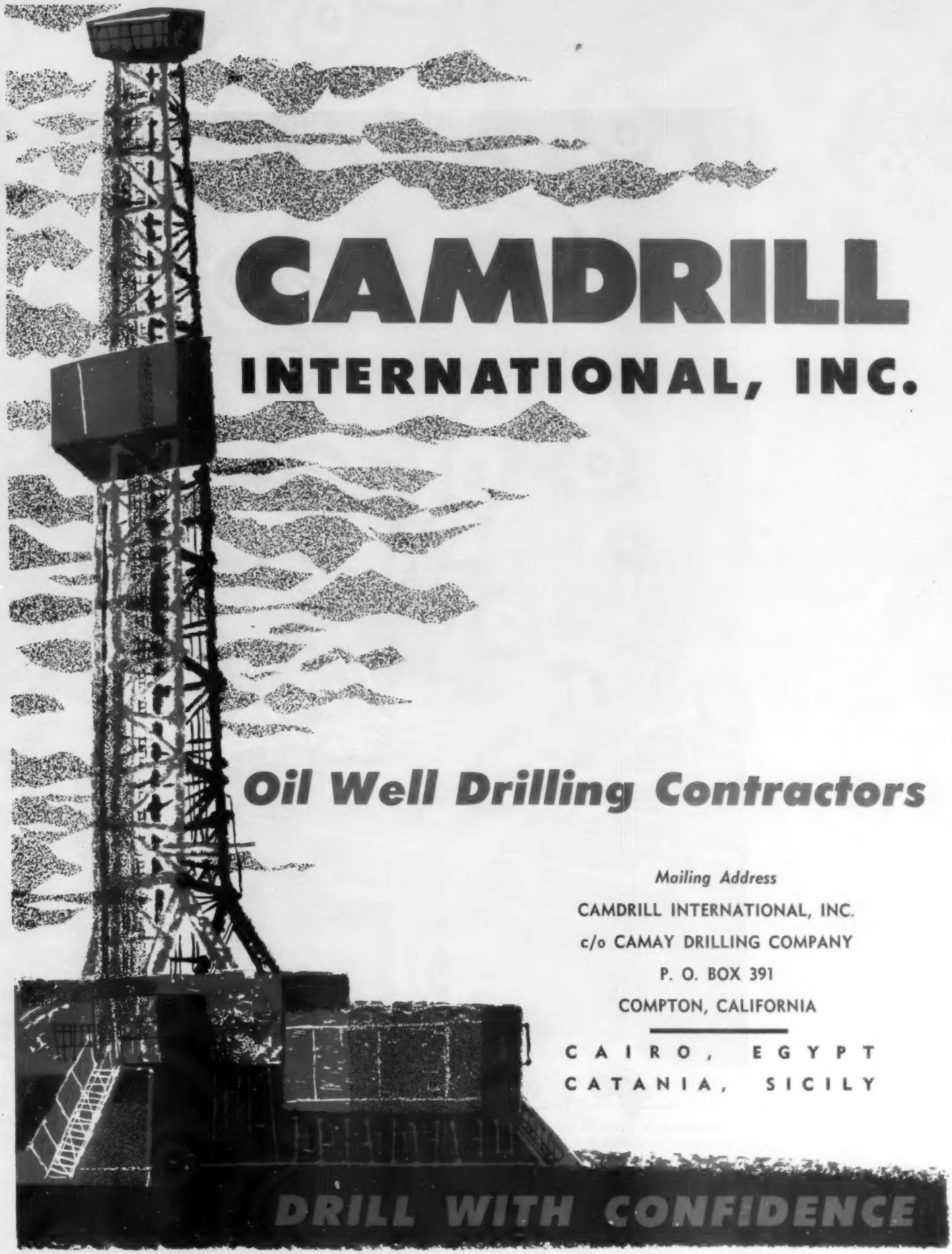

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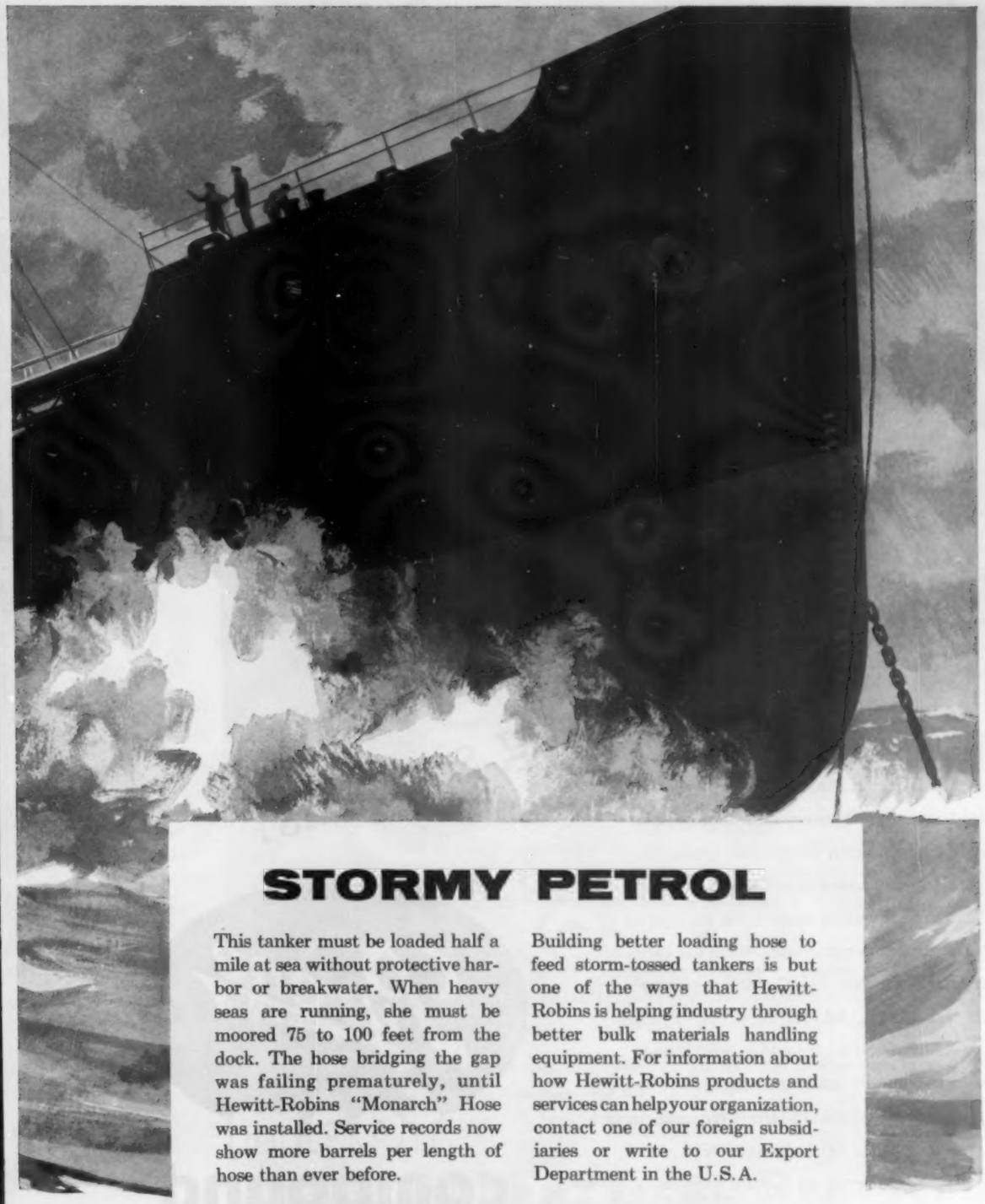

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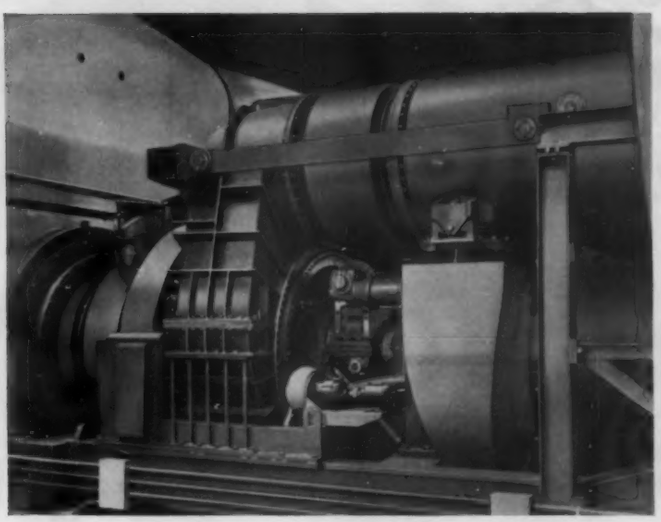

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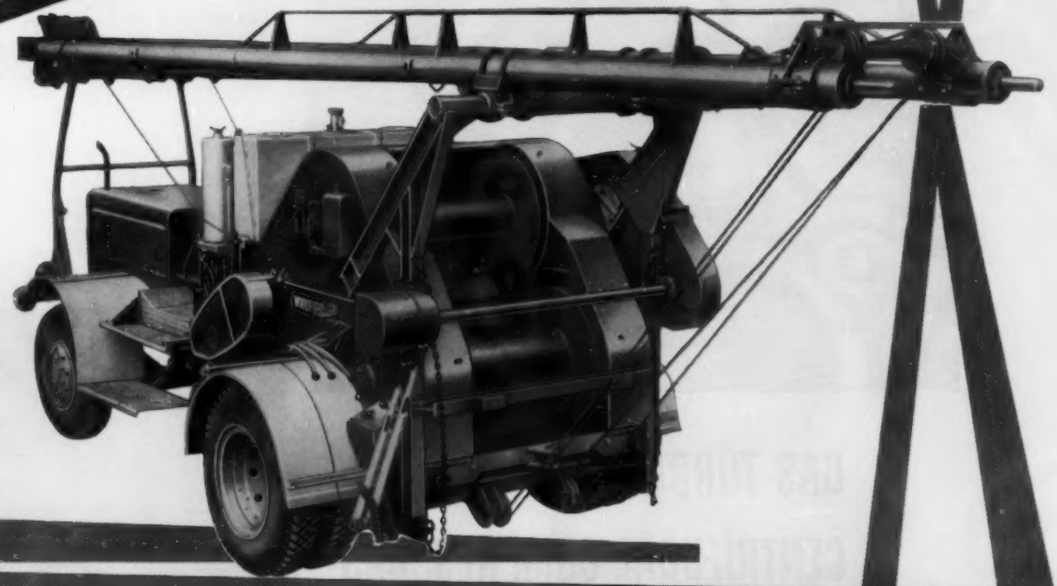

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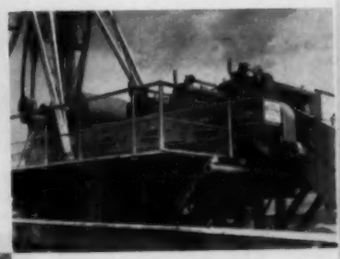

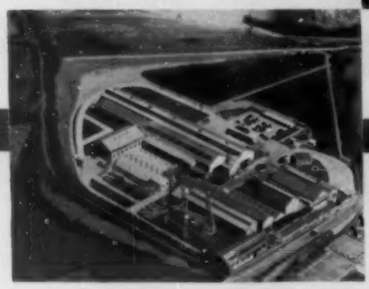

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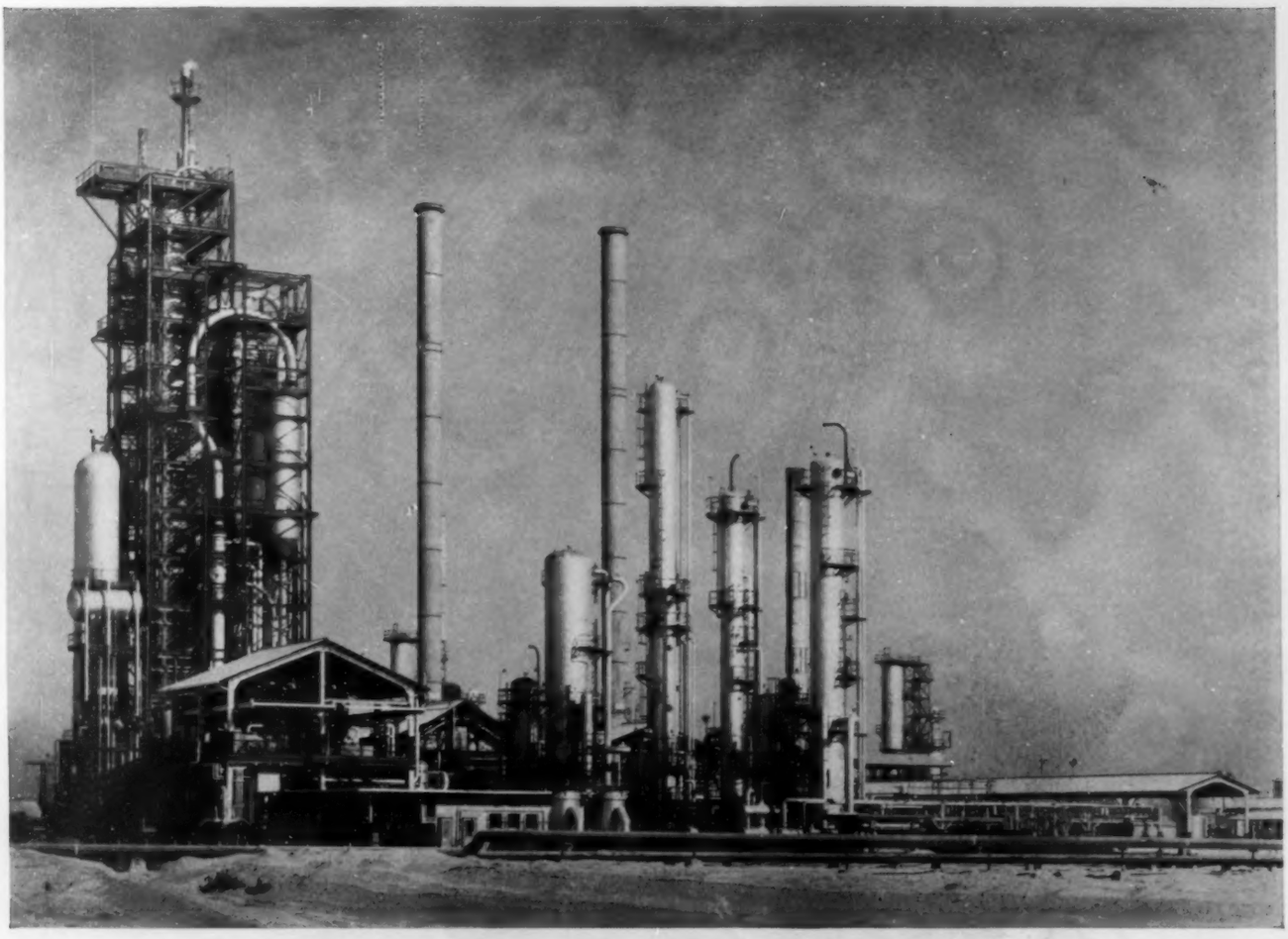

# Lummus, Aramco teamwork supplies more quality gasoline from Saudi Arabia

In August at Ras Tanura, Saudi Arabia, a 12,500 B/D Fluid Hydroformer is undergoing its first turnaround since it came on stream in October, 1955. For the past 10 months this unit has supplied 92.5 F-1 clear octane blending stock to European and Middle East markets, where the need for quality gasoline is growing rapidly.

The Hydroformer was designed and engineered by Lummus for The Arabian American Oil Company under license from Esso Research and Engineering Co. The process, though more complex than any other in the Ras Tanura Refinery, was designed for ease of operation to fit in with the Company's policy of training and upgrading Saudi Arab nationals to the fullest extent.

Close liaison among the three groups during all phases of design and construction has paid off. Startup was smooth, with all facilities operating at full design rate soon after feed was introduced. And the plant has been operating successfully ever since, at and above the design rate. In all cases, hydroformates of premium quality have been obtained from the high paraffin – low naphthene stocks characteristic of Arabian crudes.

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VOL. 27, NO. 10 SEPTEMBER, 1956

# World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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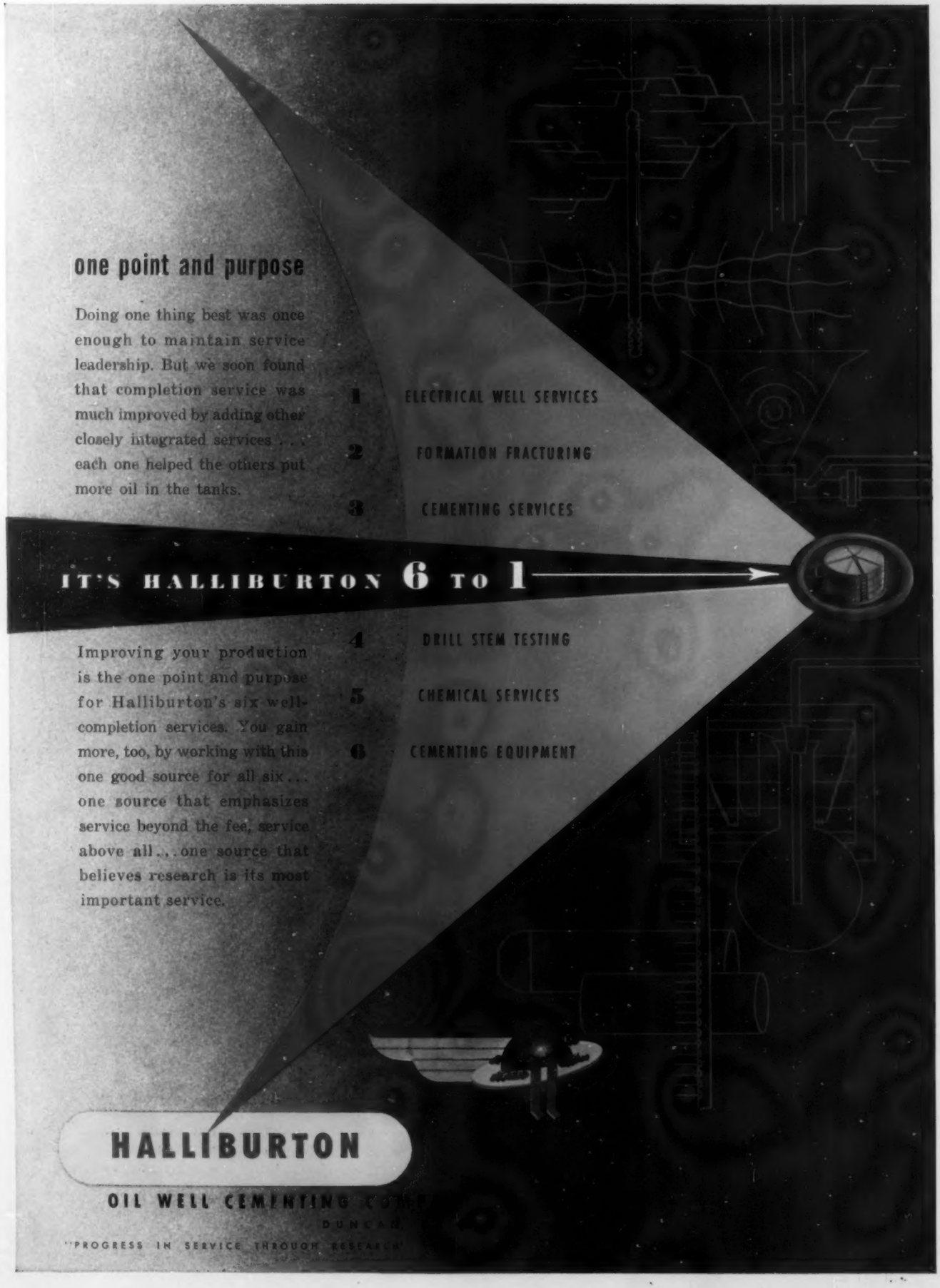
## THIS MONTH'S COVER

**The new 300 million cubic foot gas processing plant at Reynosa, Tamaulipas, Mexico, completes another step in Petroleos Mexicanos' vast expansion program of the oil and gas industry of Mexico. The plant, painted in many colors derived mostly from native pigments, lends a spark of life and vitality to this arid region of the Rio Grande valley. The whole area is particularly attractive at night when Pemex's glazed tile office building is lighted and the plant area is illuminated with many lights, ranging from floods to decorative street lights. Hudson Engineering Corp., Houston, designed the plant. The color plates were reproduced through the courtesy of Hudson and the color photograph was taken by Harold Bordelon, advertising engineer for Hudson. A description of the plant begins on page 84 of this issue.**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# Suez Not Vital To Petroleum

WHEN plans of the oil industry for 1956 were made known, around the beginning of the year, they pointed to an intensification of the search for oil and gas throughout the world. International companies were seeking to extend their operations to new and broader areas. Numerous governments had liberalized their laws to encourage private capital to engage in petroleum development or for enlarging their own activities in the fields of exploration, production and marketing. All this activity was inspired by realization that the world had entered upon a new era of power consumption that is expected to continue at a high rate for years to come; that oil is a preferred source of energy as compared with coal and other forms of fuel, and that it is a most convenient source of tax revenue and funds for improvement of the economy of the producing nations.

Now that 1956 is well advanced on its charted course, it is evident that the anticipated rise in production will be realized. Output of crude in the first six months exceeded the demand of products for consumption.

In the United States increased exploration drilling points to the probability that a record number of wells will be put down during the current year. In the first six months the increase in purely domestic production amounted to 5.5% over the corresponding period of 1955. In other parts of North America, the Caribbean area and South America, oil companies are holders of newly granted leases and concessions or contracts with governments for testing new prospects or extending existing holdings. In Venezuela, for example, daily output has risen this year by 200,000 barrels daily and the government is opening to development new areas in or near highly productive fields or in other promising regions. Altogether the Western Hemisphere is in a position to add substantially to the world's daily supply.

In the Eastern Hemisphere exploration is being extended to many regions that have not been tested heretofore and is fortified by important discoveries in the prolific fields of the Middle East. Each year since the end of World War II the proportionate growth of production in this hemisphere has been consistently higher than in the West and early estimates of probable gain in 1956 are placed at 10% higher.

In the midst of this orderly progress a sensational event occurred that demonstrated in striking fashion the dependence of the present economy upon oil. This was the decree of President Nasser of Egypt in late July "nationalizing" the Suez Canal which was accepted in all the capitals of the world as creating a crisis which might lead to war or to a crippling of activity among the main oil-consuming nations.

While it is true that petroleum provides the greatest tonnage of any single commodity moving through the Canal (about 70%) and is correspondingly important to its revenues, it is pointed out by marine experts that the world is not yet in the position of being wholly dependent on the Middle East for its supply of oil and that the present is a time when it would be least difficult to dispense with the utilization of Suez. By adding substantially to the daily production of North and South America, the Western Hemisphere would be independent of Canal-borne supplies and could contribute substantially to European markets.

Arbitrary steps threatened by Egypt at the beginning of the present controversy, such as closing of the Canal to tankers or introducing discriminatory regulations, undoubtedly would be met by reactivation of the foreign sales committee in the United States and by providing pooling of supplies and shipments so located that they could reach European markets by routes other than Suez. Such action proved effective in filling the gap caused by the sudden disappearance of Iranian oil from world markets when Iran's industry was "nationalized."

At the present time the trend in transoceanic oil carriers is strongly in favor of supertankers. Carrying heavier loads at much higher speeds, these vessels can compete effectively with those of lesser draft. As recently as five years ago a tanker of 20,000 tons gross was a rarity, but since that time tonnages have doubled. The 45,000-ton carrier has arrived and is proving its usefulness; others of double that size are under construction, and the 100,000-ton tanker is taking shape in the minds and on the drawing boards of marine architects.

Since oil is the chief financial support of Suez, the government of Egypt can scarcely afford to overlook the great flexibility which the petroleum industry has exhibited many times in the past in adapting itself to changing conditions. Since Egypt has nothing to gain but much to lose in pursuing its present course, the chances are that an agreement will be reached for continued use of Suez in its proper place as an important commercial highway between East and West.

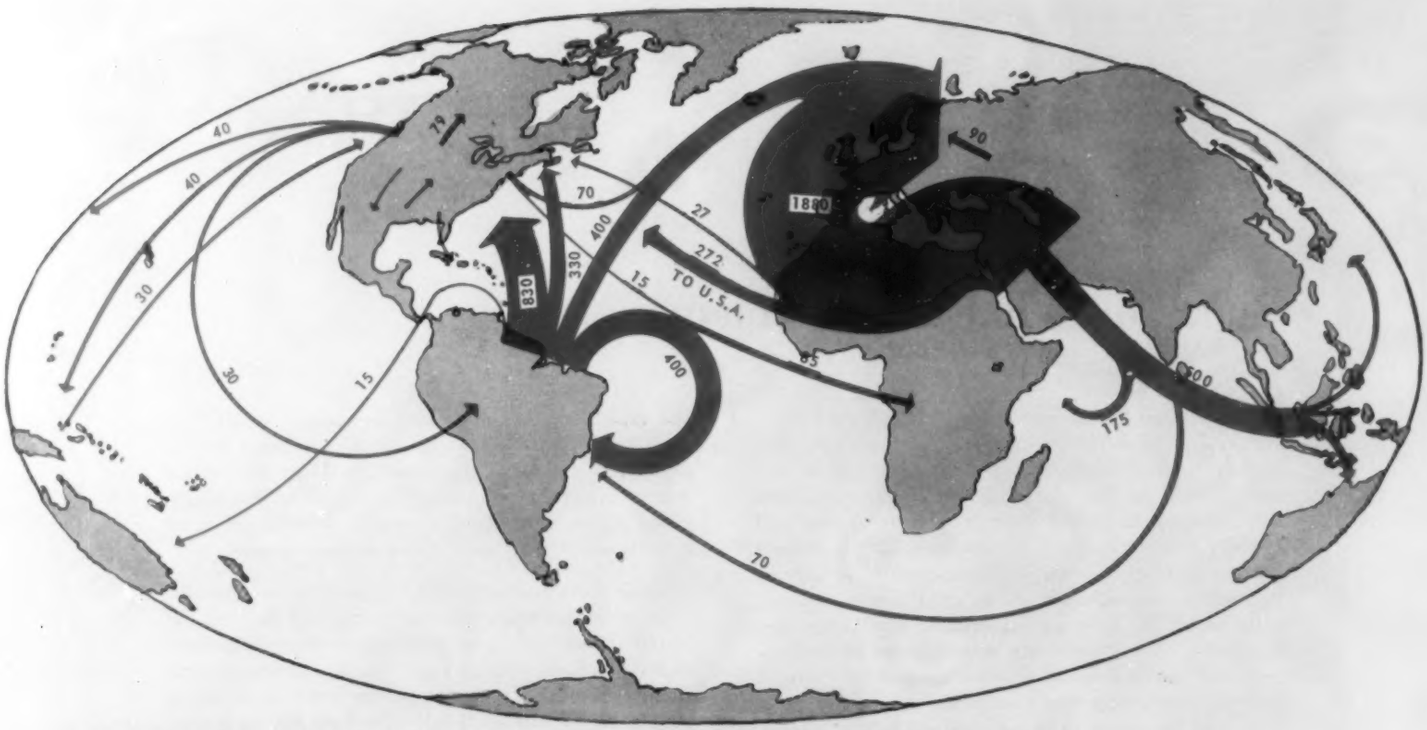



*Chart indicating principal intercontinental movements of petroleum and products in 1955. Figures indicate approximate shipments in thousands of barrels daily. Arrows are not intended to show route followed, only origin and destination continents.*

# WORLD PETROLEUM CONSUMPTION EXPANDS

*Demand for petroleum and its products in 1956 is expected to approximate 17,295,000 b/d. Consumption outside the United States is estimated to rise 10.1 percent.*

WORLD demand for petroleum in 1956 is expected to average 17,295,000 b/d, an increase of 7.7% on a daily average basis. On a calendar year basis the total will be about 7.9% higher due to the extra day. This compares with a world wide increase in 1955 of 11% over 1954, a figure well above the trend in recent years.

Since 1940 world demand has risen at the average rate of 8% per year. United States increase has averaged 6% and the remainder of the world about 11%. In 1955 every area increased its consumption at a far more rapid rate than the average of the previous 15 years. This year the increase in the United States is slightly below the recent trend while elsewhere in the world the trend is being maintained. The USSR and satellite countries are believed to be increasing their consumption this year by about 12.5%.

Based on trends established in early months of the year it is estimated that total world demand will be about 6.33 billion barrels, compared with 5.87 billion barrels in 1955. Western Hemisphere demand may be about 3.98 billion barrels and Eastern Hemisphere consumption 2.35 billion barrels.

In the United States the estimate used in this compilation is that domestic demand will increase 5.4% this year to 3.24 billion barrels. This is the most recent forecast of a committee of the Independent Petroleum Association of America. In recent weeks some economists have been revising their estimates downward as week-by-week data compiled by the American Petroleum Institute has indicated a slowing down of the rate of increase in refinery shipments. The full month's stoppage of the steel industry due to the nation-wide strike has had an indirect as well as a direct influence on demand.

As against this it should perhaps be noted that early estimates of U. S. demand by the I.P.A.A. in recent years have tended to be on the conservative side. The 1955 estimate published in WORLD PETROLEUM last September suggested an increase of 6.5% whereas the actual figure for the year was 8.45%. With such a large increase last year it is, of course, more difficult to attain a similar percentage in 1956.

John G. Winger of Chase Manhattan Bank, New York, recently called attention to the June demand figure in this United States which was only 2.8% higher than June 1955. This brought the increase for the first half of the year down to 5.9%. The increase in gasoline demand has been only 3.7% while distillate consumption was up 11.4%, as a result of cold weather early in the year.

This bank's economist suggested to American refiners that they reduce gasoline production 30 million barrels over the next three months and increase distillate yield by 55 million barrels in the same period. He urged caution on the part of both inmporters and domestic producers and refiners during the last half of the year.

Elsewhere in North America both Canada and Mexico continue to build up oil demand at a rapid rate. The Canadian market has been expanding at an 11% rate in recent years and is expected to consume at least 7.9% more oil this year than in 1955. The

Mexican increase is now placed at 7.45%.

Latin America as a whole has been a good oil market in recent years. Last year the increase was 10.6% to an average of more than a million barrels daily. This year it is indicated that an increase of 7% will bring demand to 1,082,000 b/d. Brazil, Venezuela, Colombia and Cuba are outstanding examples of nations which are using much more oil each year. Others are not far behind in rate of increase.

For the entire Western Hemisphere the anticipated rate of increase this year is 5.8%, the North American rate being 5.65% and the South American rate 7%.

Eastern Hemisphere market expansion continues at a more rapid rate—although from a smaller base and with a much smaller per capita utilization than in the west. In 1955 the demand increase was 15.5% to 5,779,000 b/d. This year the volume increase in eastern demand may be a little less than in 1955 but the rate of increase should be about 10.8%, very close to the average for recent years. Estimates by WORLD PETROLEUM in recent years have tended to be quite conservative and this may be true again this year.

Early reports from Europe suggest a 1956 increase of 12.5% compared with 16.7% increase in 1955. Economic expansion plans of the Soviet bloc indicate an expansion in the USSR and its satellites of 12.9%, a little sharper rate of rise than in Western Europe. Western Germany, Denmark, Sweden, France, Italy and Switzerland all appear to be having good years.

Africa consumed 425,000 b/d of petroleum in 1955 and is expected to require 450,000 b/d this year, an increase of 5.9%. Southern, eastern and western Africa appear to be expanding much more rapidly than the troubled areas bordering on the Mediterranean.

With oil operations restored in Iran that nation's consumption is rising again at a rapid rate. Part of this is, of course, due to bunkering of tankers calling at Persian ports for oil cargoes. The rise in consumption this year is estimated at 26.5% to 62,000 b/d. Two years ago it was less than half that figure. Elsewhere in the Middle East a rise of about 8% is anticipated.

The remarkable post-war improvement of the oil business in the Orient, Southeast Asia and Oceania continues without abatement. As reported in a recent article[1] Japan is unable to expand its production of coal of water power materially so that the expanding economy must rely on oil as a source of energy. Consuming 69.7 million barrels of petroleum in 1955, Japan is expected to increase this to 79 million barrels this year making it one of the great oil consuming nations of the world. Domestic supplies are inadequate or entirely lacking in other areas in Asia, Australasia and Oceania so that as the standard of living improves and local industrialization expands the oil industry is favored with new trade.

[1]WORLD PETROLEUM, April, 1956, p.38

(*Continued on page* 152)

**ESTIMATED WORLD CONSUMPTION OF PETROLEUM PRODUCTS**

(Crude Equivalent Basis—Thousands of Barrels)

| | 1955 | | 1956 | | Percent[1] |
|---|---|---|---|---|---|
| | Total | B/D | Total | B/D | Change |
| Canada | 226,665 | 621 | 245,952 | 672 | + 7.9 |
| United States | 3,071,475 | 8,415 | 3,246,054 | 8,869 | + 5.4 |
| Mexico | 83,585 | 229 | 90,036 | 246 | + 7.2 |
| Others | 5,475 | 15 | 5,856 | 16 | + 6.7 |
| **N. America** | 3,387,200 | 9,280 | 3,587,898 | 9,803 | + 5.7 |
| Argentina | 80,300 | 220 | 84,546 | 231 | + 5.0 |
| Bolivia | 1,825 | 5 | 2,196 | 6 | +20.0 |
| Brazil | 66,795 | 183 | 73,932 | 202 | +10.4 |
| Chile | 14,235 | 39 | 15,372 | 42 | + 7.7 |
| Colombia | 16,790 | 46 | 18,666 | 51 | +10.9 |
| Cuba | 20,805 | 57 | 23,058 | 63 | +10.5 |
| Ecuador | 2,920 | 8 | 3,294 | 9 | +12.5 |
| Netherlands West Indies | 44,895 | 123 | 46,482 | 127 | + 2.4 |
| Peru | 14,235 | 39 | 15,372 | 42 | + 7.7 |
| Puerto Rico | 10,585 | 29 | 12,078 | 33 | +13.8 |
| Trinidad | 11,315 | 31 | 11,712 | 32 | + 3.1 |
| Uruguay | 9,855 | 27 | 10,614 | 29 | + 7.4 |
| Venezuela | 46,356 | 127 | 49,776 | 136 | + 7.1 |
| Central America | 13,505 | 37 | 13,908 | 38 | + 2.7 |
| Others | 14,225 | 39 | 15,006 | 41 | + 5.1 |
| **S. American & Caribbean** | 368,650 | 1,010 | 396,012 | 1,082 | + 7.0 |
| **WESTERN HEMISPHERE** | 3,755,850 | 10,290 | 3,983,910 | 10,885 | + 5.8 |
| Austria | 13,505 | 37 | 15,006 | 41 | +10.8 |
| Belgium | 35,770 | 98 | 38,796 | 106 | + 8.2 |
| Denmark | 24,090 | 66 | 27,816 | 76 | +15.1 |
| Finland | 8,760 | 24 | 9,516 | 26 | + 8.4 |
| France | 146,000 | 400 | 161,772 | 442 | +11.0 |
| Germany (Western) | 92,710 | 254 | 108,336 | 296 | +16.5 |
| Greece | 11,680 | 32 | 12,078 | 33 | + 3.1 |
| Ireland | 8,760 | 24 | 10,614 | 29 | +20.6 |
| Italy | 87,965 | 241 | 101,016 | 276 | +14.5 |
| Netherlands | 52,195 | 143 | 57,472 | 157 | + 9.8 |
| Norway | 18,980 | 52 | 20,496 | 56 | + 7.7 |
| Portugal | 9,855 | 27 | 10,248 | 28 | + 3.7 |
| Spain | 22,630 | 62 | 24,888 | 68 | + 9.7 |
| Sweden | 56,575 | 155 | 64,050 | 175 | +12.9 |
| Switzerland | 14,600 | 40 | 16,104 | 44 | +10.1 |
| United Kingdom | 217,540 | 596 | 237,900 | 650 | + 9.1 |
| Yugoslavia | 6,205 | 17 | 6,588 | 18 | + 5.9 |
| USSR & Satellites | 580,350 | 1,590 | 667,950 | 1,825 | +12.9 |
| Others | 64,605 | 177 | 71,004 | 194 | + 9.6 |
| **Europe** | 1,472,775 | 4,035 | 1,661,640 | 4,540 | +12.5 |
| Algeria & Tunisia | 14,965 | 41 | 15,738 | 43 | + 4.9 |
| British East Africa | 7,665 | 21 | 8,418 | 23 | + 9.5 |
| British West Africa | 5,110 | 14 | 5,490 | 15 | + 7.2 |
| Belgian Congo | 3,285 | 9 | 3,294 | 9 | — |
| Canary Islands | 15,695 | 43 | 16,470 | 45 | + 4.7 |
| Ethiopia & Somaliland | 4,745 | 13 | 5,124 | 14 | + 7.7 |
| Egypt | 37,230 | 102 | 38,430 | 105 | + 3.0 |
| French West Africa | 13,140 | 36 | 14,274 | 39 | + 8.3 |
| French Morocco | 6,935 | 19 | 6,954 | 19 | — |
| Spanish Morocco | 3,650 | 10 | 4,392 | 12 | +20.0 |
| Portugese West Africa | 4,380 | 12 | 4,758 | 13 | + 8.3 |
| Southern Africa | 28,105 | 77 | 30,378 | 83 | + 8.8 |
| Others | 10,220 | 28 | 10,980 | 30 | + 7.1 |
| **Africa** | 155,125 | 425 | 164,700 | 450 | + 5.9 |
| Aden | 24,455 | 67 | 25,254 | 69 | + 3.0 |
| Bahrain | 5,110 | 14 | 5,490 | 15 | + 7.2 |
| Iran | 17,885 | 49 | 22,692 | 62 | +26.5 |
| Iraq | 8,760 | 24 | 9,516 | 26 | + 8.3 |
| Israel | 9,855 | 27 | 10,980 | 30 | + 9.0 |
| Saudi Arabia | 20,075 | 55 | 21,228 | 58 | + 5.5 |
| Syria & Lebanon | 10,220 | 28 | 10,614 | 29 | + 3.6 |
| Turkey | 10,585 | 29 | 11,346 | 31 | + 6.9 |
| Others | 20,805 | 57 | 21,960 | 60 | + 5.3 |
| **Middle East** | 127,750 | 350 | 139,080 | 380 | + 8.6 |
| Australia | 58,400 | 160 | 62,952 | 172 | + 7.5 |
| Ceylon | 6,570 | 18 | 7,320 | 20 | +11.1 |
| India | 38,690 | 106 | 42,090 | 115 | + 8.5 |
| Indonesia | 27,375 | 75 | 29,280 | 80 | + 6.7 |
| Japan | 69,715 | 191 | 81,618 | 223 | +16.7 |
| Malaya | 26,280 | 72 | 27,450 | 75 | + 4.2 |
| New Zealand | 11,680 | 32 | 12,810 | 35 | +10.0 |
| Pakistan | 12,410 | 34 | 13,176 | 36 | + 5.6 |
| Philippines | 14,600 | 40 | 15,372 | 42 | + 5.0 |
| Indo China | 4,380 | 12 | 4,026 | 11 | — 8.3 |
| Thailand | 5,840 | 16 | 6,222 | 17 | + 5.9 |
| Formosa | 3,650 | 10 | 3,660 | 10 | — |
| Hong Kong | 5,475 | 15 | 6,222 | 17 | +11.7 |
| Burma | 2,190 | 6 | 2,562 | 7 | +16.7 |
| Others | 66,795 | 183 | 65,880 | 180 | — |
| **Far East & Oceania** | 354,050 | 970 | 380,640 | 1,040 | + 7.2 |
| **EASTERN HEMISPHERE** | 2,109,700 | 5,780 | 2,346,060 | 6,410 | +10.8 |
| **WORLD TOTAL** | 5,865,250 | 16,070 | 6,329,970 | 17,295 | + 7.7 |

[1]Percentages are based on daily averages.

*Sixty percent of Europe's growing oil consumption moves from the Middle East through the Suez Canal. Shipments to the Orient are declining.*

# IMPACT OF SUEZ ON EUROPE'S OIL

NATIONALIZATION of the Suez Canal by President Gamal Abdel Nasser is causing the petroleum industry to make a close examination of the European oil supply line. Although President Nasser has asserted that the busy 103-mile waterway will be kept open to all nations, the nationalization has caused worry, coming as it has in a period of general uncertainty in the Middle East. Current difficulties of I.P.C. and Tapline regarding pipeline taxes and profit sharing are examples.

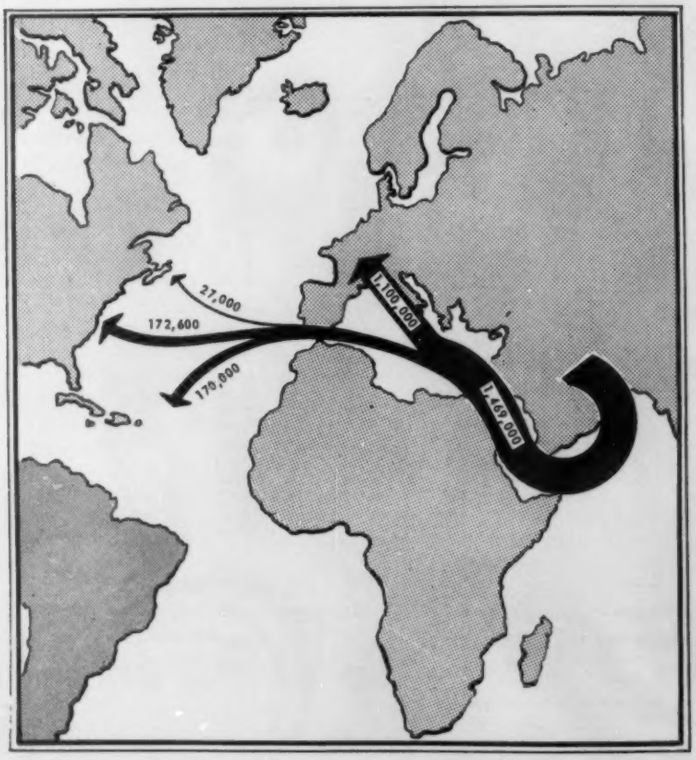
Of the 1,880,000 b/d of crude imported by Europe in 1955, from the Middle East 61.8% or 1,163,280 b/d came through the Suez Canal. The remaining 716,720 b/d was pumped to eastern Mediterranean ports by pipe line.

Supply lines to the Western Hemisphere are not as badly affected as are those to Europe. To Argentina and Brazil, the largest importers of oil in Latin America, the Cape of Good Hope route is satisfactory. The distance from Kuwait to New York, however, is 12,000 miles by the Cape and 8,500 miles through the Suez Canal. The 40% increase in mileage is far from being compensated for by freedom from canal tolls in the case of the average tanker. In the case of shipments to destinations north of Hatteras the advent of the newest and largest super-tankers is causing a reappraisal of the alternate routes. With a maximum authorized draft of 34.6 feet in Suez, it now becomes necessary for the largest tankers to pass through the canal only partly loaded. Once in the Mediterranean the cargo may be topped out at pipe line terminals and the journey continued under full load. Recently one super-tanker operator has concluded that the route around Africa is, on the whole, cheaper. Another company's studies have indicated that tankers of 70,000 dwt and larger will move oil to North Atlantic ports more cheaply via the Cape.

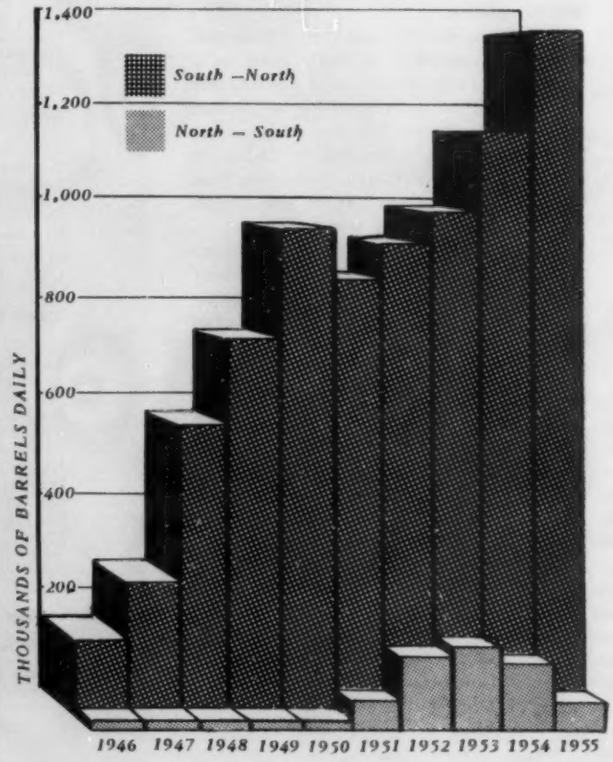
Based on the war-time T2 tanker, however, the canal represents a great economy since a Kuwait-New York voyage of 48 days is increased to 66 days by way of the Cape. After payment of $7,600 in Suez tolls the round trip saving is estimated at $46,000.

Western Hempishere shipments through the canal are small compared with the movement to Europe. Total movements to the Western Hemisphere averaged about 369,000 b/d, of which 172,600 b/d moved through Suez to the United States and 1,980 b/d to other countries. The remaining

*South-north oil movement through the Suez Canal during 1955. Figures indicate approximate movement in barrels daily. Arrows indicate only source and destination. They are not intended to show route followed.*




*Oil Movements through the Suez Canal. Data based on Suez Canal Co. reports. Decline in north-south movements is due to the activation of new refineries south of Suez, especially Aden and Abadan.*



195,000 b/d moved by pipe line and tanker or around the Cape. In 1955 the 12 principal European consumers of Middle East crude received 1,100,000 b/d of oil via Suez as follows:

| Destination | Barrels Daily |
|---|---|
| England | 410,860 |
| France | 242,960 |
| Italy | 146,820 |
| Netherlands | 145,680 |
| Belgium | 41,000 |
| Sweden | 39,720 |
| West Germany | 27,740 |
| Portugal | 17,200 |
| Canary Islands | 15,920 |
| Spain | 3,280 |
| Yugoslavia | 540 |
| Denmark | 320 |

Of the 1,337,860 b/d of oil moving northward through the Suez in 1955, some 63% originated in Kuwait. Iran also was a growing user. The following tabulation shows daily average shipments from various countries for the past two years.

| ORIGIN | Barrels Daily 1955 | 1954 |
|---|---|---|
| Kuwait | 837,400 | 817,740 |
| Saudi Arabia | 134,640 | 126,420 |
| Iran | 99,160 | 9,540 |
| Iraq (Fao) | 78,800 | 50,520 |
| Qatar | 77,440 | 82,660 |
| Bahrain | 39,900 | 20,000 |
| Indonesia | 39,320 | 20,320 |
| Aden | 14,800 | 1,240 |
| Neutral Zone | 12,460 | 7,400 |
| Egypt | 2,700 | 1,240 |
| New Guinea | 940 | 2,080 |

The increase in northbound oil traffic through the canal since the close of World War II has been phenomenal as shown in an accompanying diagram. Southbound movement is tending to dry up as refining operations increase east of Suez.

In 1946 only a third of the tonnage moving through the canal was oil. Last year northbound oil tonnage was 9.5% and southbound tonnage 76.5% of the total.

Southbound oil movement through the canal consists entirely of refined products. With the reopening of the refinery at Abadan and commissioning of the Aden refinery last year, there was a sharp drop in these shipments. In 1954 refined oil shipments to the south averaged 121,688 b/d and last year this was down to 38,100 b/d. Russia and Romania were the largest south-bound shippers and the only ones to show an increase. Russian deliveries averaged 9,340 b/d, up 5,840 b/d and Romania 7,060 b/d, a rise of 3,280 b/d. British shipments fell 33,680 b/d, Italian 18,720 b/d and French 16,960 b/d.

A substantial volume of oil for Europe as previously mentioned is available by pipe line from Iraq fields and via Tapline across the desert from Saudi Arabia. In 1955 Tapline delivered 319,178 b/d to the Mediterranean through its 31-32-inch line. New pumping facilities now are being installed which will bring throughput in 1958 to about 410,000 b/d. Ultimate capacity of the present line is 500,000 b/d. Iraq Petroleum company's big-inch line laid in 1952, had an initial capacity of about 340,000 b/d. I.P.C. deliveries this year may average 520,000 b/d through the 30-32-inch line to Banias, Syria, and the two 16-inch lines to Tripoli, Lebanon. Ultimate capacity of the big-inch is 550,000 b/d. Plans are about to increase I.P.C. capacity to 800,000 b/d when the present transit tax controversy is settled.

Pipe line deliveries to Europe could be stepped up to around 1,000,000 b/d without great delay. This increase of about 150,000 b/d over 1955 would do little more than keep pace with the current rate of increase in demand.

In 1955 European oil consumption rose 16.7% and it is estimated that the 1956 rise will be about 12.5%. Thus it is clear that Europe needs to bring in at least a million barrels of oil daily through Suez. The alternative all-ocean voyage to England is almost double the Suez route making the added cost of oil much more severe than would be the case to the Western Hemisphere.

President Nasser stated in nationalizing the canal that he expected to use the income to build the high level Asawan dam. Unless the canal is kept open to oil traffic this income will not be available for the announced purpose. This suggests, of course, that it will be to the advantage of Egypt to keep traffic moving and not to advance rates to the point which will direct shipping around the Cape and stimulate the construction of new pipe lines.

Experience of the Suez Canal Company has been that constant dredging is required to keep the canal open through the sandy desert. Any protracted closing of the waterway would create a financial disaster for Egypt. Of the $93 million in annual canal tolls $52 million is required to operate and dredge the channel. Most of this money would have to be spent to keep the canal operable.

In any appraisal of the situation pure economics cannot be relied on exclusively. When strong emotions are involved as in the present crisis, action sometimes is taken which is not economically sound. The Iranian nationalization is a case in point. In that case, Iran was brought to the brink of disaster by unwillingness on the part of Premier Mossadegh to negotiate a new agreement.

The new crisis also involves power politics and global defense strategy so that economic consideration again may not be the final ruling factor in any action. In case of a global war, Suez is considered of the utmost strategic importance although there is now some doubt about the ability of the military to keep the canal open and operating in the face of determined opposition from the air. In World War II, interruptions were not serious as a result of German and Italian bombing but military techniques have changed in the past decade.

There has been recent discussion in the U.S. press regarding the feasibility of laying a pipe line across Israel from Eilat to the Mediterranean to by-pass Suez. Such a pipe line of big-inch dimensions would cost about $30 million and could be completed within a year. Doubt of the practicability of installing such a line has been expressed because of the attitude of the leaders of Arab producing countries toward Israel.

Scareheads in the daily press have suggested that the closing of Suez would bring paralysis to England and France. This is to be doubted in view of the ingenuity which the industry has often shown in past emergencies. A number of measures can be taken to minimize the shock effect. This would include the elimination of cross hauls and an increase in the movement of oil from west to east.

The U.S. Foreign Supply Committee already has met to give preliminary consideration to possible methods of meeting an emergency. It was this committee of British and American oil experts which with U.S. Government cooperation solved the shipping tangle in 1951 which was precipitated by nationalization in Iran and the closing of the Abadan refinery. The committee succeeded in meeting Eastern Hemisphere oil requirements with little hardship to consumers and the general economy of areas which had depended on Abadan. END

*Tanker moving through Suez Canal.*

*New director general of the Suez Canal Co., Mahmoud Younis (seated at right, bald, in shirtsleeves) holding his first press conference, following Egypt's seizure of the Canal.*

*A process perfected in San Juan Basin gas wells where fracturing oils are scarce and expensive is now being used in oil well stimulation procedures.*

*Riverfrac equipment at the well. Trusk in forground is a blender. Sand truck is in the center and Allison-powered pumpers at right.*

# Water proves successful in FORMATION FRACTURING

"RIVERFRAC" is the newest variant of formation fracturing developed to assist oil producers in economically recovering more oil from tight formations and in the reworking of old wells. The method involves the use of water and sand or water alone as a means of fracturing the formation. Developer of "Riverfrac" is Dowell, Inc.

Water as a fracturing fluid was first tried in the San Juan Basin to improve production of gas wells. Fracturing oils in the area were scarce and costly. Operators involved in the pioneer work were El Paso Natural Gas Co. and Pacific Northwest Pipe Line Corp. In the past six months the experiment has spread to other areas where it has been used in oil as well as gas formation treatment. Recently a well in the Spraberry field in West Texas was fractured with 250,000 gallons of water and 200,000 pounds of sand. Previously 100,000 gallons of water was injected into a well in the McCamey pool. In the past few months more than 250 wells have been given the Riverfrac treatment.

Dowell engineers point out that plain water is the ultimate in low cost fluid for fracturing. When fracturing first was developed by Stanolind Oil and Gas Co., a thickened distillate was used as a sand carrier, the thickening agent being similar to that used in wartime flame throwers. Cost of the fluid was about 20 cents per gallon. Later it was found that crude could be used successfully. This brought fluid cost down to between five and ten cents per barrel. Plain water may cost nothing or as much as 0.75 cent per barrel depending on the distance it must be hauled to the well site. In the Spraberry well mentioned above, water was hauled in tank wagons and stored in twelve 500-barrel tanks for injection.

Results of fracturing with water have been even better than with oil in some instances. One well producing 2.5 b/d with a high salt content increased its oil output to 88 b/d immediately after treatment and 30 days later was still flowing 60 b/d.

Two adjacent gas wells, each with the same initial production 128 mcf/d were fractured, one with diesel oil and the other with water. The Riverfrac well's output rose to 4,500 mcf/d and the diesel oil treated well to 4,250 mcf/d.

One oil well was swabbed dry after an oil frac treatment. Later 50,000 gallons of fresh water were injected and two weeks later the well was making 70 b/d of oil and a similar quantity of water.

Fire hazard is minimized when water is used. In the case of gas wells there is no contamination of the area surrounding the well when the liquid is sprayed into the air as is sometimes the case with oil.

Operators have noted that the high density and low viscosity of water have aided pumps in delivering maximum fracturing power to the formation.

Some fear was felt at first that water might tend to cause swelling of clays in formations and retard production. Laboratory tests were conducted of the swelling tendency of pulverized formation rocks. Results of tests on a number of samples are shown in Table I. Dowell engineers suggest that the fracturing process itself overcomes part of the difficulty caused by silicate swelling because the fracturing opens larger passages than flow channels previously existing in the formation. Chemical control agents can be added if necessary.

There is also a possibility of the formation of stable emulsions when water is used. Practice is to conduct tests prior to fracturing and, if necessary, add chemicals to reduce surface tension or an emulsion preventing agent.

Salt content of producing formation may retard production of oil or gas. When water is used as a fracturing agent it may tend to flush out the salt and improve production. On one well treated with fresh water, analysis of the water returned to the surface indicated that it had remover 54,500 pounds of salt from the formation.

In some fields it has been found desirable to use brines as a fracturing fluid. These cause less clay swelling, but care must be taken to discover whether the available brines are compatible with formation water to avoid undesirable precipitation.

Inhibited hydrochloric acid is used as a water additive to dissolve carbonaceous materials where desirable. This may tend to retard the dissolving action of water. A compromise between lime and salt-dissolving capacities is usually found at acid concentrations of from two to five percent.

Dowell has found that high pumping rates are important in Riverfrac. High velocity is necessary to maintain proper sand suspension. Both immediate and long-time results are better at pumping rates above 20 bbl/min. Sand of 20/40 or 40/60 mesh is used. Where proper input velocity cannot be obtained the water is thickened with a gelling agent or to eliminate the sand. Good results have been obtained without sand. In all cases Dowell recommends a preliminary study of various factors before a method of treatment is adopted. END

**TABLE I**

**Comparison of the Volumes Occupied by Equal Amounts of Pulverized Formation Rock After One Hour Exposure.**

| | In Fresh Water | In Kerosine | In Spent 15% Acid | In Spent 15% Acid Containing Silicate Control Agent |
|---|---|---|---|---|
| Sample A | 2.6 | 2.3 | 2.0 | 1.8 |
| Sample B | 2.9 | 2.6 | 2.8 | 2.6 |
| Sample C | 2.6 | 2.4 | 2.4 | 2.4 |
| Sample D | 3.0 | 2.3 | 2.5 | 2.1 |
| Sample E | 2.7 | 2.5 | 2.7 | 2.4 |

*Growing consumption in Russia coupled with oil shortage in Siberia are forcing the pace as*

# Russia expands pipe line network

By Dr. George G. Rosu and J. C. Chatfield

DURING the current Plan, Russia has resolved to double her crude oil production and, concomitantly, to extend the pipe line network by two and one-half times. This is the most ambitious expansion program recorded in the history of the Russian oil industry. The often raised question as to whether Russia might be able to handle 2.7 million b/d of crude oil by 1960 should, therefore, be answered in the affirmative.

At the present time, the Soviet pipe line network measures approximately 7,300 miles. In this figure are included the field gathering lines and the 800 mile long pipe line commissioned last autumn between Ufa and Omsk. With the exception of the latter, the network was built prior to 1940, largely before World War I. The pipe lines capacity is, therefore, commensurate with the production volume at the time of their laying as well as the modest prospects envisaged then. The largest lines are those connecting Gurev with Orsk, Tuimazy with Ufa and one of the two lines running from Makhachkala to Grozny: their diameter is 12 inches. The diameter of the remaining lines vary between 6 and 10 inches. The station spacing and operating pressures are insufficient to provide maximum capacity.

The current Plan calls for an expansion of the network by 9,000 miles. Hence, by 1960, the Soviet network will comprise more than 16,000 miles of pipe lines. Carrying capacity, however, will increase more than proportionately with length, i.e. from 1 million b/d at the present time, to almost 2.6 million b/d in 1960. In terms of distance, the network's transportation capacity will amount to 51 million barrel/miles per day.

In the new publication, "National Economy of the USSR," now being circulated it is stated that oil tonnage carried by pipe lines in 1955 was 3.64 times as great as in 1940 before the outbreak of World War II. By 1960 it is planned to increase tonnage to six times the 1955 level. Taking 1940 as an index figure of 100 the USSR reports tonnage at 129 in 1950, 268 in 1954 and 364 in 1955.

The magnitude of Russia's network expansion plan has been dictated by serious and manifold reasons, the range of which goes beyond the limited scope of the oil industry. It is meant to solve a series of bottlenecks which are arresting the growth of the Soviet economy. In their order of importance, the obstacles which precipitated the expansion program of the Soviet pipe line network are as follows.

High on the list is the geographical fact that Russia is a land power. She must, therefore, rely mostly on overland transportation facilities. Indeed, 84% of total goods are carried by rail. Sea and river navigation take only 12% of the freight. At the present time, at least half of the oil freight is handled by railroads. The transportation cost is too high, and the oil products become too expensive. In addition, the Soviet railway system is already loaded to its maximum limit, and is unable to handle additional freight. To expand the rail network and the number of freight cars is costlier than to expand the pipe line capacity. This explains the choice made by the Soviet Planning Board.

Another factor is that in 1953, the Soviet government was forced to face the long postponed grain shortage problem which threatened the biological existence of the Russian people. The only reserves of land left were those in Northern Kazakhstan and Altai. The transportation arteries in this area are very sparse and thus unable to handle the fuel needed for the cultivation of some 80 million acres of additional land. This explains the laying of new pipe lines along the northern borders of these two regions, and further east.

Still a further addition to the planned pipe lines to the West was dictated by the shrinking fuel and energy base of the European part of Russia which hampers any further expansion in industrial production there.

Another important factor was the diminishing supply of raw materials and solid fuels which dictated the industrialization of Siberia, the completion of which is slated to occur during the next three Five-year Plans. This vast but untamed subcontinent is apparently devoid of any commercial oil deposits; hence the need to transport overland liquid fuels over a distance of 3,000 to 4,000 miles. The transportation bill of oil

30
40
50
60
FINLAND
Gulf of Finland
Baltic Sea
BALTIC COUNTRIES
Lake Ladoga
ARCHANGELSK
KOMI
POLAND
WHITE RUSSIA
MOUNTAINS
Yaroslavl
Kostroma
Moscow
Gorki
Molotov
URAL
Bryansk
Ryazan
Izhevsk
Orel
Kazan
Kama R.
UKRAINA
Tambov
Penza
Almetyevsk
Tuimazy
Ufa
SECOND BAKU
Voronezh
Kinel
Syzran
Buguruslan
Sterlitamak
Troitsk
ROMANIA
Odessa
Dnepropetrosvk
Saratov
Kuibyshev
Ishimbai
Magnitogorsk
Voroshilovgrad
Chkalov
Stalino
Orsk
Stalingrad
Rostov
Emba
Don R.
Aktyubinsk
Volga R.
Basin
Black Sea
Krasnodar
Tuapse
Kulsary
Armavir
Dossor
Maikop
Gurev
CAUCASUS
NORTH
Rakusha
Kosa
Grozny
Batumi
Makhachkala
Lake Aral
Tbilisi
TURKEY
Izberbash
TRANS-CAUCASUS
Kirovabad
UZBEKISTAN
Baku
Caspian Sea
Krasnovodsk
TURKMENIA
Neftedag
Kyzyl Arvat
Ashkhabad
IRAN
Rosa—1956
LEGEND
Oil pipe lines functioning in 1956
Oil pipe lines under construction: to be ready in 1960
SCALE 1:9,000,000
0 50 100 200 300 400 500
MILES

World Petroleum Map of Russian Pipe Lines
ARTIC CIRCLE
70
80
90
100
65
60
55
50
45
40
KRASNOYARSK
OMSK
Ob R.
Yenisei R.
Angara R.
SIBERIA
SIBERIA
SIBERIA
Lake Baikal
Taishet
Kansk
Krasnoyarsk
Achinsk
Nizhneudinsk
Marinsk
Cheremkhovo Basin
Irkutsk
Tomsk
Tobol R.
Irtysh R.
Novosibirsk
Tatarsk
Kuznetsk Basin
Petropavlovsk
Isil Kul
Omsk
OUTER MONGOLIA
Sea of Okhotsk
Okha
Nikolaevsk
SAKHALIN
Amur R.
KAZAKHSTAN
Lake Balkhash
Komsomolsk
Khabarovsk
Amur R.
KIRGIZ
MARITIME TERRITORY
MANCHURIA
CHINA
Sea of Japan
TADZHIKISTAN

products to Siberia amounts to well over one billion rubles per annum which raised the cost of oil by an average of 60%. The overtaxed capacity of the Trans-Sib and Yuzh-Sib railways precludes any further increase in oil freight to Siberia overland. The planned pipe lines, running along these railways, from Omsk to Irkutsk, was the most economical solution: the saving in transportation costs achieved in this way will help to finance construction of the new pipe line.

Finally, the geographical disposition of the new pipe lines is explained by the soaring production of the Volga-Ural oil area, commonly referred to as the "Second Baku"[1]. Although its development started only after the war, this area yielded last year 57% of the total crude output of Russia and, in 1960, is expected to raise its rate to 1.9 million b/d; this represents almost 75% of Russia's entire planned production. Owing to application of secondary recovery methods on a large scale, the cost of the Second Baku crude is only one-third of the cost level in other oil areas. But the concentration of production on a small area has also created great transportation problems which now appear to be solved by the laying of the new pipe lines.

Geographical disposition of the planned pipe lines appears to be that indicated on the accompanying map. It reveals that, by 1960, Russia will have three pipe line networks, interconnected by rivers and railways.

The Southern Network will remain Russia's longest oil supply artery. This artery is a combination of river, sea and dense pipe line transportation systems, and encompasses the long span from Austria to Turkmenia. The Danube from Vienna to the Black Sea is the gathering line for oil surpluses which Russia squeezes out of East European producers. In addition, the Romanian oilfields are connected with the Danube through one pipe line; through another, which ends in Odessa, they supply Ukraina with oil products.

The Black Sea is pooling oil products from Romania as well as from the North-Caucasian and Trans-Caucasion refineries. It serves, in the main, as a supply base for Russia's biggest oil consuming region: Ukraina, Odessa and Constantza are the only harbors where oil is loaded in tankers and sent to Western markets and to the Far East.

The double Baku-Batumi pipe lines as well as that running from Krasnovodsk to Ashkhabad are connected by the Caspian Sea and serve mostly to carry oil products. The North-Caucasian pipe line from Makhachkala to Tuapse is used mostly to carry crude and products from Grozny. From Armavir, it branches off to the north, and carries oil products to Voronezh and Dnepropetrovsk.

With the exception of the short trunk line to be laid between Grozny and Tbilisi, no further expansion of the Southern Network is envisaged during the current Five-year Plan.

The other two networks divide the great task of carrying the soaring crude production of the Second Baku.

The middle network is planned to distribute oil from the southern areas of the Second Baku, namely from Chkalov, Kuibyshev and Saratov, as well as from Stalingrad which lies further south on the Volga. This network will be expanded to create an 800 mile long supply line for the industrial centers lying south of Moscow: Penza, Tambov, Orel and Bryansk. In all probability, this pipe line will be ultimately extended westwards to Kiev in the Ukraine and to Minsk in Byelorussia.

The middle network is planned to become a combined artery, i.e. to use also the tanker shipping facilities available on the Volga River and the Volga-Don Canal. With the opening of the latter in July 1952, some 27,000 miles of river shipping ways in the European part of Russia were joined into one single transportation system which is further connected with the northern and southern seas. It will soon be connected also with the artificial seas that are being created at Kuibyshev and Gorky. The combination of the shipping and the pipe line networks will solve a great deal of the transportation bottlenecks in this area, shorten the endless transportation of crude and products in opposite directions and, thereby, cut the transportation costs for oil alone by at least 250 million rubles annually.

Most impressive is, however, the expansion planned for the Northern Network which will span over a distance of 3,200 miles, from Moscow to Irkutsk on the shores of the Baikal Lake. It is this network that will carry the bulk of the Second Baku and, implicity, of Russia's production after 1960. In it are merged actually two transportation systems: one set of pipe lines will distribute the crude oil from Tataria west and north, whereas the second set will carry Bashkirian crude oil to east and south.

According to Soviet planning, the Tatar fields will yield in 1960 almost 230 million barrels or half of the expected increase during the current planning period; hence, the pressing need to extend quickly the transportation facilities. From Tataria, oil will be pumped to the new refining center now in construction at Gorki. Here the pipe line will be branched off: one line will end at the Yaroslavl refining center, while the other will serve Ryazan and Moscow. Another line will stem from Almotyevsk, run along the Kama River to Izhevsk and end up at Molotov; this is meant as a supply artery for the Urals industrial centers.

The distribution centers of Bashkirian crude oil are Tuimazy and Ufa which, at the same time, are the most prolific oil fields and the biggest refining centers of this Republic. From Tuimazy start two lines: the first one to Omsk, which has been in service since last autumn; the second, under construction, will connect this center with Orsk and thereby to the Caspian Sea.

Ufa is slated to become Russia's most important oil distributing center by 1960, and to remain the vital artery of supply for Siberia. From here starts a second pipe line to the east which is now under construction and runs, parallel to the Trans-Siberian, to Omsk. From Omsk, a single pipe line will carry oil products to Novosibirsk, Tomsk and a chain of consumption centers ending at Irkutsk, near the Mongolian border. The projected Ufa-Irkutsk line will be 2,400 miles long, and will supply also the new farming regions of the Altai Province.

The second pipe line from Ufa is being laid with one functional purpose in mind, namely to supply with fuel the new farms established recently along the northern fringes of Kazakhstan. It runs parallel to the railway connecting Magnitogorsk, Akmolinsk, Pavlodar, Kulunda and further east, along the trunk line under construction between Atbasar and Turgai.

There are two characteristic developments connected with the distribution of the Bashkirian oil surpluses. The first is in regards to Ufa. By 1960, this oil center will become also the seat of a central panel which will control automatically the flow of crude oil and oil products through 8,000 miles of pipe lines. The second refers to Omsk which is being developed to become Russia's second distribution center.

At the end of the current planning period, Omsk will become the terminal point of three large pipe lines and, apparently, the biggest processing center in the Soviet Union. For the time being, it will become the supply center for the Western half of Siberia. However, it is not excluded that Omsk may have to supply, after 1960, also the area beyond the Lake Baikal as far east as Khabarovsk. Russia's pipe line expansion program has not come to an end yet.

There are two conclusions that may be derived from these Soviet figures and plans:

As to volume, the network's capacity will be still below the crude oil production level planned for 1960. Consequently, a quantity equal to the output of oil products in that year will have to be transported by other means than pipe lines. To cope with this load, Russia will have to further expand her pipe line network.

As to operating capacity, the planned increase in the carrying capacity is higher than the comparative length of the new pipe lines added to the network. This indicates, on the one side, that the diameter of the new pipe lines will be much larger than anything built in the past, and may vary between 20 and 30 inches; on the other side, it may be presumed that power and spacing of the pumping stations as well as the operating pressure will be far superior to present standards, and may reach Western levels. END

*(1) See G. G. Rosu: "The Perplexing Second Baku", WORLD PETROLEUM, November 1955, pp. 110-114.*

*The inability of such traditional sources as coal and electricity to fulfill the world's growing energy needs focused attention on . . . .*

# Oil at the Fifth World Power Conference

**By Dr. George Rosu**

THERE were two conspicuous items in the balance-sheet of world energy drawn in Vienna last month by the Fifth World Power Conference. First was the growth in world energy demand since 1950 at the unprecedented annual rate of 4.5%. The second was the rapid shift in the importance of supply sources as oil and natural gas combined have relegated coal to second position in world's energy picture. Future demand is expected to grow even faster than during the preceding years and so will oil's importance. Atomic energy is still a far cry as its production costs are well above those of energy produced by conventional fuels.

The foremost task of the conference was to appraise the energy sources on a worldwide basis and to assess future trends. The energy derived from solid fuels dropped from 61% in 1950, to almost 47% last year. In contrast to this, the contribution of oil and natural gas to total energy supply rose, during the same period, from 37.5% to 50%. In the near future coal energy is expected to be displaced by oil and natural gas at an even faster rate.

This is not due to any lack of coal reserves. At the present production rates, known and probable coal reserves represent at least 2,500 years of supply. Coal production, however, has increased by a mere 1% annually since 1950. The explanation lies in the economic sphere, e.g., the comparative costs which render coal digging unattractive, especially in North America and Mexico where mining and transportation costs are such that the price per energy unit generated by coal is much higher than that obtained from oil and gas. In world shipping, too, coal consumption has been dwarfed by oil, and today amounts to only 12% of the total fuel consumed. A steady, yet slower, decline is being noticed also in coal consumption in household as well as by railway where diesel propulsion is gradually displacing the steam locomotive.

Some countries are experimenting with new methods which aim at cutting coal production costs and thereby render it more competitive. One is underground coal gasification, particularly of deeper and thinner seams, a method which attains, at the same time, a complete burning of coal. Another experiment is to transport coal through pipe lines under water pressure. However, neither of these methods has reached the commercial stage as yet.

In contrast to coal, oil last year covered no less than 31% of the world's energy demand. Ten years ago, this proportion was 20%. During the next decade, the world is estimated to rely more on oil as an energy source than on all other fuels combined.

Although it was not a gathering dedicated specifically to the study of petroleum problems, the Fifth World Power Conference took the opportunity to take stock of oil reserves and assets, to size up the future oil demand, and to estimate the probable means to cover it. The world's proven reserves were estimated at 143 billion barrels as per Jan. 1, 1955 which, computed at prevailing production rates, means 28 years of supply. This figure does not include offshore reserves.

During the 1950-1955 period, two important shifts were recorded in the oil picture. First, the Middle East now possesses no less than 60% of the world's proven reserves. Its production has already surpassed 20% of the world's total, while the US share has dropped to 44%.

The second shift was recorded in the supply pattern. While in 1948 the US consumed 64.7% of the world's oil production, in 1954 it took only 53.9% thereof. One-seventh of its current requirements are covered from imports, and this proportion will rapidly increase during coming years. The world's greatest oil consumer will thus become increasingly dependent on outside sources of supply, particularly on those in the Middle East. The same is true of England whose oil consumption increased, during the last five years, by one-half. Owing to the manifold difficulties in raising production of its coal mines, this country will rely almost entirely on oil imports to cover its booming consumption.

By the same token, the countries of the OEEC zone used 9.3% of world's oil output in 1948, and 13.8% in 1954. Last year, their demand rose to about 1.5 million b/d, of which only a negligible fraction was covered from domestic production. During the next decade, the imports of the OEEC zone may double, with West Germany and France taking the biggest bite.

In all European countries, the financial effort required to conduct oil exploration is out of proportion to the means at those countries' disposal. At present, 70% of all expenses for prospecting and exploration drilling are covered from public means, and only 10% by foreign investors. Drilling costs per exploration well are three times higher than in the USA. This is the main stumbling block which bars a further expansion of exploratory activity on the Continent.

The best choice left to the OEEC zone is to import all the crude oil, and to concentrate its limited means upon expanding the processing capacity. According to official estimates, this item alone may require a total investment of up to six billion dollars during the next ten years. Compared with those countries' investment rate, even this amount is likely to be a backbreaking effort. Therefore, foreign investors will have to step in and carry the main load of this expansion program.

Although the importance of natural gas energy source is steadily rising (it is now the third source after coal and oil), it was surprising to note that only six countries reported to the conference on gas developments. Complete information is available only on the world's biggest gas consumers: US, Canada and Mexico. Natural gas already covers 25% of US energy consumption, and the gas network is expanding almost twice as fast as that for transportation of crude oil and oil products. In Europe, only Italy is developing her natural gas production which, at present, covers 8% of the total energy supply. The search for new gas fields is carried on in many parts of the world, but no good discoveries are reported. There was no new contribution to the chemistry of natural gas among the papers presented to the Fifth World Power Conference.

Electric power generation grew by 50% during the past five years, e.g. at an annual rate twice as high as that of the total energy supply. Power consumption surpassed already 1.5 trillion kwh, but its proportion in the overall energy picture is still insignificant. Average world consumption (China excluded) rose from 490 kwh per capita/year in 1950, to almost 700 kwh last year. Most of the electric power produced is generated by fuel burning. For this reason, many technical papers presented to the Conference focused their attention upon this point, i.e. how to make a better use of the fuel burnt through improvement of the generator installation, and how to use more low-caloric coals (even young lignites and peat) as boiler fuel.

The share of water power in the total power generated is visibly decreasing. The explanation lies in the unpredictable climatic conditions which in some places lower water availability during the winter

(*Continued on page* 120)

*Scientists from 23 nations meeting in Philadelphia present 78 papers describing*

# ADVANCES IN CATALYSIS

THE International Congress on Catalysis held in Philadelphia from September 10-14, was attended by about 700 scientists from the United States, Canada and 23 countries of Europe and Asia. It was organized by the Catalysis Clubs of Philadelphia and Chicago, the University of Pennsylvania and the National Science Foundation. Grants had been made to numerous scientists to enable them to attend and funds for this purpose had been contributed by the National Science Foundation, the petroleum industry and the chemical industry.

A total of 78 papers were presented and discussed at the Congress, about half of which were written by scientists from abroad. All papers had been preprinted to facilitate discussion and complete proceedings of the Congress will be published by Academic Press, Inc. as a volume in the Series "Advances in Catalysis." Twelve authors had been invited to contribute summary and review papers, covering the current state of knowledge in various fields of catalytic research. The other 66 papers treated new research.

All papers were organized into four major symposia with many subdivisions: 1) Chemistry and Physics of Solid Catalysts, 2) Homogenous Catalysis and Related Effects, 3) Surface Chemistry and Its Relation to Catalysis, 4) Techniques and Technology of Catalysis. In the following, a digest of a number of those papers will be presented, which appeared to be most interesting to the petroleum chemist and engineer.

R. E. Cunningham and A. T. Gwathmey of the University of Virginia, reported on catalytic reactions of gases on the surface of single crystals of metals and particularly on the reaction of hydrogen and ethylene on a single crystal of nickel. The rate of this reaction was studied on several faces of a nickel crystal at about 100°C, and it was found that the rates on the low index faces, such as the (110), (100), and (111), were higher than on the faces such as the (321). When a crystal in the form of a sphere was heated in ethylene to 500°C, the rate of carbon formation varied greatly with face, the low-rate faces in the carbon formation being the high-rate faces in the reaction of hydrogen and ethylene.

S. G. Hindin and S. W. Weller, of Houdry Process Corporation, showed an extensive parallelism in the behavior of λ-alumina as a catalyst for ethylene hydrogenation and for hydrogen-deuterium exchange. Catalyst activity increases with increased temperature and time of drying. Water is a catalyst poison. The poisoning effect is dependent on the temperature at which water is added to the catalyst. The source of catalytic activity is not oxygen deficiencies, but the strained, high-energy surface arising from dehydration.

Reactions of cyclopropane and of propane with deuterium over metals of group VIII were discussed by G. C. Bond of the University of Hull, England, and J. Addy of the University of Leeds, England. Pumice-supported palladium, platinum and rhodium catalysts were used at 50 and 200°C and the hydrocarbon products were analysed mass-spectrographically. The distribution of deuterium atoms in the products is characteristic of the metal, but not of the reacting hydrocarbon. Over palladium, the distribution is independent of temperature and is highly unsymmetrical. The distribution over platinum and rhodium vary with temperature. The parameters of the distributions can be related to the physicochemical properties of the metals.

*Physical Properties of Catalysts.* An improved method of deriving pore size distributions was disclosed by R. W. Cranston and F. A. Inkley of British Petroleum Company. This method also provides information on pore shapes. The complete distribution of surface area in pores with diameters smaller than 300 A is derived almost independently of the BET area and an independent estimate ($S^o$) of total surface area is available for comparison with the BET value of (S). For most classes of materials S is in good agreement with $S^o$ calculated from the adsorption branch, but in much poorer agreement with the cumulative surface calculated from the desorption branch of the isotherm.

The physical properties of several coprecipitated mixtures of chromium oxide and alumina have been investigated by R. H. Griffith and J. D. F. Marsh of North Thames Gas Board, England. Energies of activation were calculated for the ring closing reaction of paraffins to aromatics and for electrical conduction. Measurements were also made of the activity of the catalysts for the conversion of methylcyclohexane to toluene. The structures of the catalysts were studied by x-ray and magnetic methods. The results of these measurements indicate that the energy of activation for the formation of aromatic hydrocarbons follows closely that for electrical conduction, and this suggests that the rate controlling step is the formation of conducting centers.

The activity and selectivity of semiconducting oxide catalysts for the dehydrogenation of butenes was investigated by H. C. Rowlinson and R. J. Cvetanovic of the National Research Council, Canada. Oxides of zinc, iron and nickel are highly sensitive to small amounts of oxides of similar cation radius, but different valence (Li, Al, Cr, Ti). In oxide catalysts that are reducible in bulk under operating conditions (NiO, $Fe_2O_3$), the additives appear to affect catalysis not through alteration of surface states, but through retardation of ionic mobility in the bulk. In zinc oxide, the added oxides have a large effect on the BET surface area; in addition they appear to cause a considerable change in the rate of reaction and a smaller one on the selectivity to butadiene. Such changes are related to the band theory of solids.

*Acid-Base Catalysis.* H. I. Waterman and C. Boelhouwer of the University of Delft, Holland, reported on sulfur dioxide as a homogenous catalyst. Reactions discussed as catalysed by $SO_2$ are: 1) transformations of unsaturated compounds (cis-trans isomerization, shifting of double-bonds), 2) polymerization and addition reactions, 3) decomposition of aromatic hydroperoxides, yielding phenols as the main products, 4) hydration and dehydration reactions.

*Adsorption Phenomena.* J. H. deBoer of Staatsmijnen in Limburg, Holland, discussed the relations between endothermic chemisorption and catalysis. Endothermic addition compounds between the reacting molecules and the catalyst molecules may play an important role in homogenous catalysis. Similarly, endothermic chemisorption compounds may be expected to be of great importance in some hydrogenation, isomerization and oxidation reactions on metallic, oxidic or salt catalysts.

*Catalytic Cracking.* J. D. Danforth of Grinnell College, discussed recent studies of the structure of silica-alumina cracking catalysts. There are indications that active centers are composed of alumina of 3 coordination number, where the aluminum is connected to two silicons by way of oxygen linkages. Chains of active sites appear to exist at distances of approximately 5A°. Mechanisms of reactions catalysed are presented to show the role of the catalyst at each step of the reaction. The analogous structure of Friedel-Crafts catalysts indicates that the reaction mechanisms of these

catalysts as well as other strong acid catalysts may follow a few simple concepts.

A new constant, expressing the thermal stability of the acid function of cracking catalysts was described by Y. J. Trambouze, M. Perrin and L. deMourgues of the University of Lyon, France. This constant equals the logarithm of the ratio of the protonic acidities of a gel measured at 500° and at 100° (and expressed as milliequivalents of hydrogen per gram of solid). This constant is a linearly declining function of the aluminum content of the gels, if this content is below 30%. The decomposition of formic acid at 200°C was used as test reaction.

A paper on the "Inhibition of Cumene Cracking on Silica-Alumina by Various Substances" was presented by R. W. Maatman, R. M. Lago and C. D. Prater of Socony Mobil Laboratories. Cracking inhibitors compete with cumene for cracking sites. Equilibrium constants for adsorption on cracking sites were presented for some pure hydrocarbons and some oxygen, sulfur and nitrogen compounds. These constants are calculated from an expression based on theoretical analysis of the kinetics in both a "differential" and an "integral" reactor.

*Other Reactions of Hydrocarbons and Reactions of Carbon Monoxide.* Isomerization, dehydrogenation and polymerization reactions of four pure hydrocarbons (2-phenylbentane, 3-methylhexan, (+) d-limonene, and cis-decalin) were studied over various catalysts by C. H. Johns and G. A. H. Elton of Battersea Polytechnic, London. The experiments were carried out in the temperature range 90-100°C, using various residence times. The nature and yields of the products obtained, and their variation with catalyst type and with operating conditions were discussed in the light of possible reaction mechanisms.

The hydroisomerization reaction, although widely used in industry, is little understood. In order to shed light on this reaction H. Pines and A. W. Shaw of Northwestern University, used ethylcyclohexane-$\alpha$-$C^{14}$ to determine possible steps in its conversion to the dimethylcyclohexanes and other hydrocarbons. Nickel on a silica-alumina support was used as the catalyst. It was found that the relative concentration of the dimethylcyclohexanes produced were approaching their thermodynamic equilibria values. The radio-activity in 1,2-, 1,3- and 1,4-dimethylcyclohexane was found to approach statistical distribution between the ring and side chain. The ethylcyclohexane recovered contained some ring labelled ethylcyclohexane. The results obtained imply that the reaction proceeds through a carbonium ion mechanism involving ring contraction and expansion. The carbonium ion thus formed undergoes many rearrangements before being converted into the final product.

S. K. Bhattacharyya and Dharam Vir of the Indian Institute of Technology, Kharagpur, presented information on a new high pressure synthesis of glycolic acid from formaldehyde, carbon monoxide and water in the presence of nickel, cobalt and iron catalysts.

*Techniques of Catalytic Study.* **Paul H.** Emmett of Johns Hopkins University, discussed the use of isotopic tracers, of chemical and physical adsorption and of vapor chromatography as tools in the investigation of catalytic reactions and mechanisms. Gas chromatography as a tool for the investigation of catalyst surfaces was further discussed in a paper by Erika Cremer of the University of Innsbruck, Austria. Gas chromatography permits determination of the adsorptive properties of catalysts. The retention time is a function of the heat of adsorption. It is thus possible to measure changes in the median heat of adsorption, caused by poisoning of the catalyst surface. Heat conductivity measurements of the effluent from the column give a clue to the concentration-distribution. Conclusions concerning the distribution of adsorption energies on the catalyst can be drawn from the concentration profile.

G. W. Bridger and D. A. Dowden of Imperial Chemical Industries, Ltd., presented an evaluation of different approaches to the testing of catalysts on a small scale. Factors controlling the activity of some classes of solids were discussed, particularly with reference to the interaction of chemical flux with mass and heat flows. Integral and differential reactors were considered for exploratory catalyst research, comparative testing of catalysts and the obtaining of data for process design. Attention was paid to the effect of catalyst condition, size and shape on technique and design of apparatus.

The utility of infra-red spectrometry for catalytic research was illustrated in a paper by R. P. Eischens and W. A. Pilskin of The Texas Co., on the "Infra-Red Study of the Catalysed Oxidation of CO." This reaction over a nickel-nickel oxide catalyst system was studied by means of techniques, which make it possible to obtain spectra of adsorbed molecules, while reactions are in progress. CO chemisorbs on nickel as a molecule bonded to the surface through the carbon, but does not absorb on nickel oxide to an extent sufficient to produce detectable bands. Carbon dioxide produces defined bands on nickel, nickel oxide and on the silica support. While CO is being oxidized, a band is observed, which fades away when the reaction is completed. This band is related to the intermediate complex in the oxidation reaction. The complex decomposes by desorption of $CO_2$, part of which is readsorbed as carboxylate or bicarbonate type ions.

*Miscellaneous Catalytic Reactions.* A report on the hydrogenative properties of oxides of vanadium and chromium was given by V. I. Komarewsky and D. Miller of the Illinois Institute of Technology. Important similarities and differences in the action of these oxides were found. Olefins are hydrogenated in the presence of either catalyst at atmospheric pressure. Hydrogenation is accompanied by isomerization. Aromatics can be partially hydrogenated in the presence of vanadia only at superatmospheric pressure. Chromia is inactive under these conditions. Neither substance catalyses hydrogen disproportionation reactions of cycloolefins. An essential difference was found in the action of these catalysts on alcohols. In the presence of vanadia, alcohols are hydrogenolysed to the corresponding paraffins. At comparable conditions in the presence of chromia, alcohols undergo a dehydrogenation-condensation reaction with production of ketones. The structure of both catalysts was examined and that of vanadia correlated with the geometrical picture of the catalytic reaction.

H. A. Smith and R. G. Thompson of the University of Tennessee, studied the catalytic hydrogenation of methoxybenzenes over platinum and rhodium catalysts. Activation energies were of the order of 4-8 Kcal per mole. For a given compound the activation energy was found to be greater for the rhodium catalyst. The amount of hydrogen absorbed per mole of compound indicates that extensive cleavage of the methoxyl groups occurred when platinum oxide was employed as the catalyst. The cleavage was much smaller with the supported rhodium catalyst. The discovery, that the rhodium catalyst, especially at lower temperatures, smoothly hydrogenates the aromatic nucleus with a slight cleavage of methoxyl groups should be of importance in organic syntheses.

Rhodium and ruthenium catalysts on carriers were investigated for liquid phase hydrogenation reactions by G. Gilman and G. Cohn of Baker & Co., Inc. The rhodium catalysts are specifically effective for the hydrogenation of the ring encyclic compounds at room temperature and pressure. All substitutions decreased the hydrogenation rates. Upon introducing methyl groups directly into the ring, the hydrogenation rate decreases exponentially with increasing number of methyl groups. Rhodium carrier catalysts are very effective in the hydrogenation of heterocyclic compounds like pyridine, pyrrole, dimethylfurane, and furoic acid. Ruthenium catalysts are specific for the hydrogenation of the carbonyl group in aliphatic aldehydes and ketones at atmospheric conditions.

A paper by J. Wagner and H. Jaeger of Technische Hochschule Graz, Austria, refutes earlier assumptions of an activated desorption of oxygen from platinum. Observations during the catalytic oxidation of CO to $CO_2$, which caused the assumption are explained by back-diffusion.

Polymerization of butadiene by the Alfin catalyst was discussed by A. A. Morton of Massachusetts Institute of Technology. This reagent, a combination of three sodium salts—alkyl sodium, sodium isopropoxide and sodium chloride—has a dual function. It initiates polymerization and then controls the manner of chain growth. Around 1% of the alkyl sodium is consumed in the initiation and termination of the process. The remainder functions catalytically as a surface upon which the diene is adsorbed and oriented in a position for rapid polymerization. END

*Discoveries of oil on continental shelves offshore from Trinidad, the United States, Saudi Arabia and Borneo and in various lakes have stimulated interest in development of marine fields elsewhere throughout the world. In this article, the writers have surveyed world offshore oil provinces which lie within reach of the drill.*

# WORLD OFFSHORE OIL PROVINCES

**By Edgar R. Locke and T. R. Goedicke**

Throughout the last few years it has become more and more apparent that the oil industry as a whole is looking toward the sea as a source for much of our future oil reserves. This increased interest in offshore oil has manifested itself in increasing marine geophysical and drilling activity, and perhaps most of all in the unusually high prices being paid for some offshore lease areas.

Up to the present time most of the marine oil activity has been centered around the continental shelf area off the coasts of Texas and Louisiana. It is believed that this new marine oil industry will expand in the immediate future to continental shelves off other coasts, and it is the purpose of this paper to outline those areas which are likely to become future offshore oil provinces.

It is interesting to note that some oil companies operating in foreign areas have found marine oil exploitation and development to be more economical than that on land. This is especially true for those undeveloped areas where all facilities, including roads and housing, must be built and maintained by the company.

A marine drilling crew can, in contrast to the costly road building program required in some primitive areas, be brought to the site and set up in a matter of days. It may be organized so as to be almost

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*Mr. Locke joined Offshore as vice president and general manager in 1953 and became its president in 1955.*

*Dr. T. R. Goedicke, chief research geophysicist for Offshore Exploration Group, Inc., Houston, taught geophysics and economic geology at Texas A & M College before joining the Offshore group. He has conducted geophysical surveys in northern Canada and has done research on the Gulf of Mexico and the Mediterranean — the latter at the oceanographic laboratory of the Sorbonne University at Antibes.*

*Dr. Goedicke received his batchelor's degree in science from McGill University, Montreal, his master's degree from North Carolina State College, Raleigh, and his doctorate from the Technical University, Munich. While in Germany he worked under the guidance of Dr. Graf, inventor of the Graf-Askania gravimeter.*

*Fig. 5. Stratigraphic correlation chart of petroliferous formations of Caribbean area countries.*

| SERIES | | STAGES | TEX-LA | OFFSHORE | E GULF |
|---|---|---|---|---|---|
| PLIOCENE | UPPER | ASTIAN | UNDIVIDED | UNDIVIDED MIOCENE | CITRONELLE FM |
| | | PIACENTIAN | | | |
| | LOWER | PONTIAN | | | |
| MIOCENE | UPPER | SARMATIAN | FLEMING | | CHOCTAW-HATCHEE FM |
| | | TORTONIAN | | | |
| | MIDDLE | HELVETIAN | | | ALUM BLUFF GROUP |
| | LOWER | BURDIGALIAN | | | |
| | | AQUITANIAN | CATAHOULA DISCORBIS HETEROSTEGINA HARRISBURG | APALACHICOLA DISCORBIS HETEROSTEGINA OCKLOCKONEE FRIO | TAMPA LS |
| OLIGOCENE | UPPER | CHATTIAN | FRIO | | SUWANNEE LS |
| | MIDDLE | RUPELIAN | VICKSBURG | | BYRAM LS |
| | LOWER | LATTORFIAN | | | |
| EOCENE | UPPER | LUDIAN | WHITSETT | | OCALA LS |
| | | BARTONIAN | MC ELROY | | |
| | | | CADELL | | |
| | MIDDLE | AUVERSIAN | CLAIBORNE | | LISBON FM |
| | | LUTETIAN | | | TALLAHATTA FM |
| | LOWER | CUISIAN | WILCOX | | HATCHETIGBEE |
| | | YPRESIAN | | | RANKIN FM |
| | PALEOCENE | THANETIAN | MIDWAY FM | | MIDWAY FM |
| | | MONTIAN | | | BUCATUNNA CL |
| | | DANIAN | | | CLAYTON FM |
| CRETACEOUS | UPPER | SENONIAN MAASTRICHTIAN | NAVARRO | | PRAIRIE BLUFF |
| | | CAMPIAN | TAYLOR | | SELMA CH |
| | | SANTONIAN | AUSTIN | | COFFEE SAND |
| | | CONIACIAN | | | EUTAW FM |
| | LOWER | TURONIAN | EAGLE FORD | | TUSCALOOSA |
| | | CENOMANIAN | WOODBINE | | |
| | | | BUDA LS | | |
| | | ALBIAN | GEORGETOWN | | |
| | | | EDWARDS | | |
| | | | COMANCHE PEAK | | |
| | | | WALNUT | | |
| | | | TRINITY | | |
| | | APTIAN | SLIGO | | |
| | | NEOCOMIAN | HOSSTON | | |
| JURASSIC | UPPER | TITHONIAN | COTTON VALLEY | | |
| | | PORTLANDIAN | | | |
| | | KIMMERIDGIAN | BUCKNER | | |
| | | OXFORDIAN | SMACKOVER | | |
| | | CALLOVIAN | | | |
| | MIDDLE | BATHONIAN | | | |
| | | BAJOCIAN | | | |
| | LOWER | TOARCIAN | | | |
| | | PLIENSBACHIAN | | | |
| | | SINEMURIAN | | | |
| | | HETTANGIAN | | | |

completely self-contained, and moving is frequently just a matter of raising the anchors.

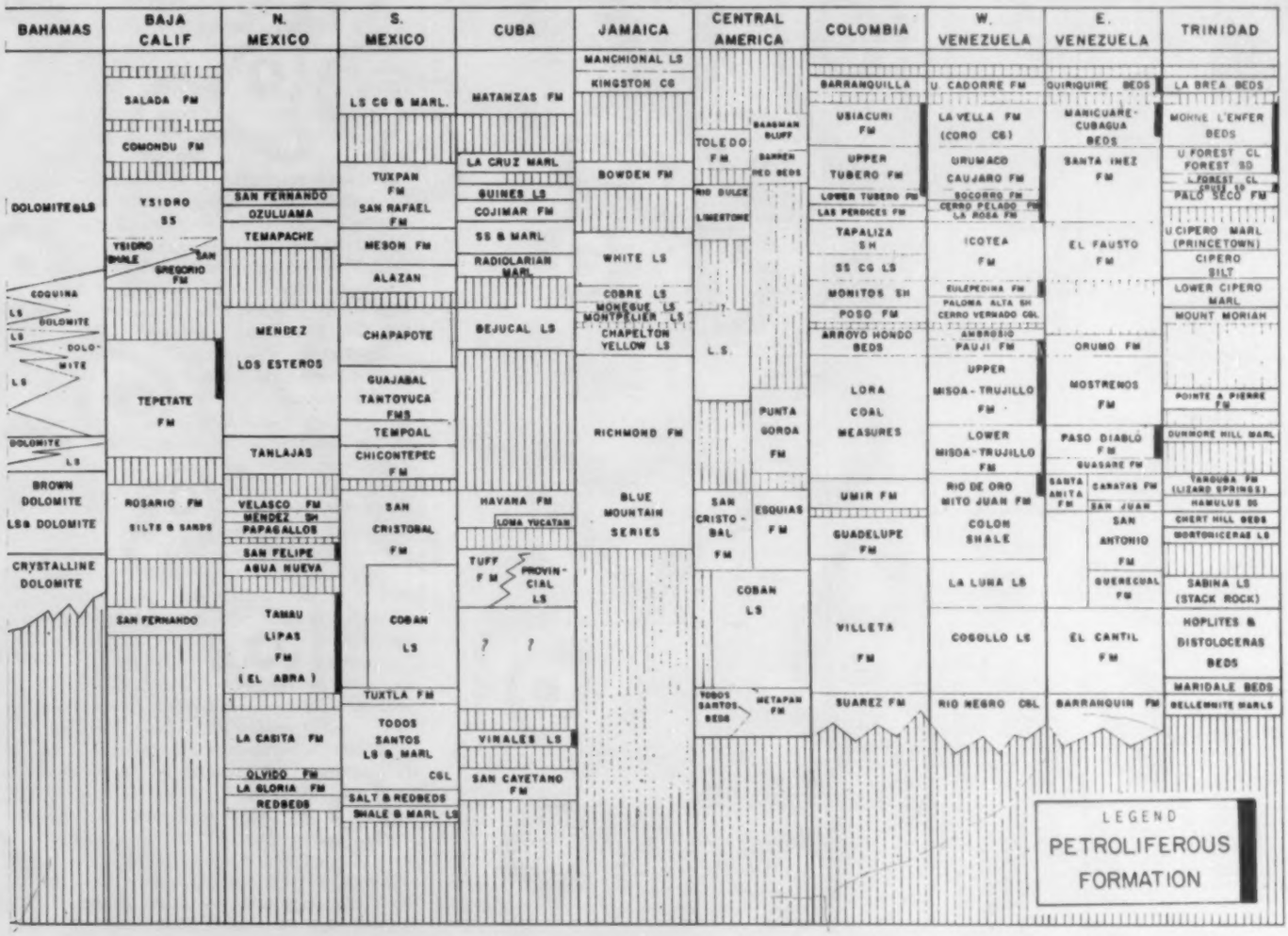
In connection with the discussion of marine oil provinces of the world, it seems desirable to review briefly the recent developments in the Gulf of Mexico. After beginning only ten years ago, and in spite of legal handicaps, exploration for oil in the Gulf of Mexico is now in full swing. Fig. 2 shows the increase in completions of offshore wells over the last few years. Conservative sources predict that five to seven hundred wells will be completed in the Gulf of Mexico this year.

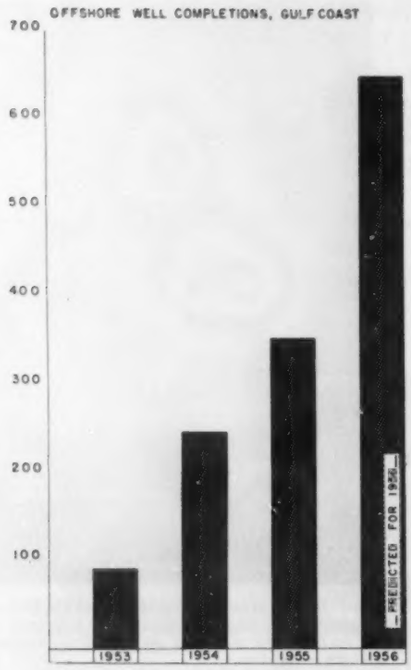
Further evidence of the rapid future expansion of this industry is provided by the number of marine drilling units in operation. These drilling units may be divided into three types; drilling tenders moored to small platforms, self contained platforms, and giant mobile units such as "Mr. Gus". The latter represents the least expensive way of drilling at sea, as no permanent installation is left at the site of an abandoned well. The lower part of Fig 2 shows the increase in all three types of drilling units during the last fifteen months preceding May 1956. Many of these drilling units are presently constructed for operations in water over 100 feet in depth. Units for depths of over 200 to 300 feet are being designed.

Evidence of the value placed on potential production from Gulf of Mexico oil fields is provided by the bonuses paid for offshore acreage. The price per acre has increased from $5.34 paid for the first marine lease sold in 1945, to an average of $421.00 paid to the Federal government for offshore acreage in July 1955. The overall average bonus for acreage off Texas over a sixteen-year period, ending April 1956 is $60.49 per acre. Bids as high as $1,770 to over $2,500 per acre paid for isolated blocks attest to the estimated value of offshore production.

One interesting fact about this large offshore industry is that acquisition of acreage and location for drilling is based almost entirely on geophysics. Up to the recent advent of the submarine geologist, who examines sea floor sediments brought up by dredges and coring devices, or who dons skin diving equipment to examine submarine outcrops, no geology was done in any marine area. All of the structures which were found in the Gulf of Mexico, exploration of which has led to the rather large number of completions shown in Fig.

*Fig. 1. Seismic crew working offshore in the Gulf of Mexico. Scenes like this will be seen frequently in all parts of the world as marine oil exploration gathers momentum.*





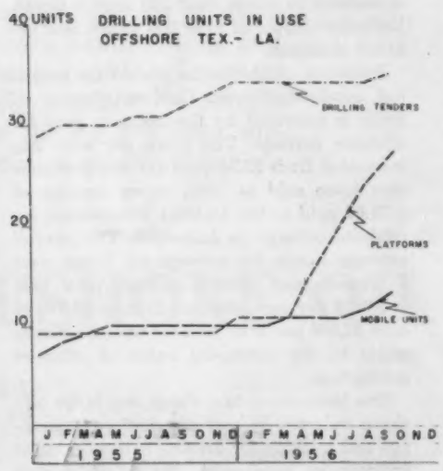




*Fig. 2. Graphs, above and at left, show the increase in offshore well completions and number of drilling units active in the Gulf of Mexico.*

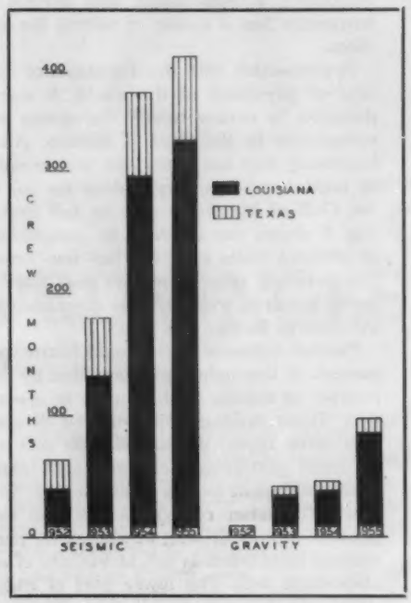



*Fig. 3. Geophysical activity in the Gulf of Mexico, 1952 to 1955.*

*Fig. 6. Stratigraphic correlation chart of coastal areas in South America*

| SERIES | | BRAZIL | ARGENTINA | PERU | ECUADOR | |
|---|---|---|---|---|---|---|
| PLIOCENE | | FRESH & BRACKISH WATER FM. | PARANA FM. | PAYTA CG. | CANOA FM. | |
| MIOCENE | UPPER | | | BAJADA FM. TUMBEZ FM. | | |
| | MIDDLE | | | CARDALITOS FM. | | |
| | LOWER | | | U. ZORRITOS FM. VARIOUS BEDS | | |
| OLIGOCENE | UPPER | | DESADO BEDS (TERRESTRIAL) | HEATH FM. | SAN PEDRO SS. | |
| | MIDDLE | | MAGELLANIAN BEDS (MARINE) | MANGORA FM. | ANCON PT. FM. | |
| | LOWER | | PLANT BEDS | CHIRA FM. VERDUN FM. | | |
| EOCENE | UPPER | | | SAMAN FM. TALARA FM. | SOCORRO FM. CLAY PEBBLE BDS. | |
| | MIDDLE | | | | MIDDLE GRITS | |
| | LOWER | PERNAMBUCO BEDS NATAL LS. | | SALINAS SANDS | GUYAQUIL LS. | |
| CRETACEOUS | DANIAN | | | | | |
| | MAASTRICHTIAN | CRUZERO RED BDS. | RAMADAS GROUP | PUCA SS. | | |
| | CAMPANIAN | | | | | |
| | SANTONIAN | | | | | |
| | CONIACIAN | SUNGARU SS. | SALAS SS. | AZUCAR SS. | NAPO LS. & SH. | |
| | TURONIAN | SH. & LS. | SALAS LS. | CHONTA LS. | HOLLIN SS. | |
| | CENOMANIAN | | | | | |
| | ALBIAN | MOA SS. | DIAMANTE LS. | AGUA CALIENTE SS. | MISAHUALLI TUFF | |
| | NEOCOMIAN | | | | | |
| JURASSIC | MALM | | | | | UPPER GONDWANA SERIES |
| | DOGGER | | | | | |
| | LIAS | | MARINE BEDS | | | |
| TRIASSIC | RHAETIC | CAIUA SS. SERRA GERA FM. BUTUCATU SS. | | | | |
| | NORIC | | | | | |
| | KARNIC | RIO DO RASTO GROUP UPPER ESTRADO NOVA FM. | SIERRAS PAMPEANAS RED SS. | | | |
| | LADINIC | | | | | |
| | ANISIC | | | | | |
| | SKYTHIC | | | | | |
| PERMIAN | UPPER | LOWER ESTRADO NOVA FM. IRATY GROUP PALERMO & BONITA | LOWER SS. | LEGEND: PETROLIFEROUS FORMATION | | LOWER GONDWANA SERIES |
| | LOWER | | TILLITES | | | |

2, were discovered by means of geophysics.

The gravimeter and the seismograph have been the principal instruments used. Seismic reflection methods have received wide application because of the great efficiency and high rate of surveying possible at sea. Under fair conditions it is possible to survey seventy miles of line per day on water as compared to five miles on land. Because of this high rate of progress it has been found that marine seismic surveys can be carried on at one third of the cost per unit area, as compared to surveys on land. This is a significant factor in marine exploration and may be one of the reasons why oil companies have been willing to bid so high for marine acreage.

Fig. 3 shows the increase in geophysical activity during the years 1952 to 1955. This increase appears to have continued during the first part of 1956. One of the astonishing facts about the use of geophysics in offshore exploration is that it has led to a success ratio of 42% of wells drilled. This is significant when one considers that the average success ratio of the industry as a whole is only 12%.

With these facts in mind let us proceed then to an examination of other continental shelf areas throughout the world, where opportunities appear to favor exploration which might be equally rewarding.

Some foreign marine areas which have produced large quantities of oil are already well known. One of these is Lake Maracaibo in Venezuela. Other proven productive areas are situated in the Persian Gulf, the Gulf of Paria and off the coast of Borneo. In the following discussion, some potentially productive continental shelf areas are examined in the light of their proximity to sedimentary basins. Most of the more important areas are described, but there are many more small areas which

cannot be covered completely within the frame of this paper.

All of the continental shelf areas under consideration are shown on Plate I. Important areas are shown on a series of detailed charts. Their outline is indicated on Plate I and they are numbered sequentially in the order of discussion.

The first area is that of the Gulf of Mexico and the Caribbean, shown on Fig. 4. On all maps the practical limit of exploration for offshore oil has been taken at the three hundred foot water depth. Areas within this depth are identified by a pattern of vertical lines, sedimentary basins are delineated by heavy lines. Basins which are productive close to shore are identified by a pattern of diagonal lines and oil fields within these basins are shown in black.

The geological formations which produce oil in the countries surrounding the Caribbean are shown on a correlation chart, Fig. 5. Those formations which are productive at present are identified by heavy lines. The most prolific producing horizons in the Caribbean area are of Tertiary age. This is especially true of offshore Texas and Louisiana and to some extent in the countries on the north coast of South America.

The marine oil provinces of the Gulf of Mexico and Caribbean areas will be discussed in sequence following the numbers on Fig. 4. Area 1 is located offshore southern Alabama and that portion of Louisiana lying east of the Mississippi Delta. This zone has not received as much attention as the continental shelf off southern Louisiana, but is expected to be actively explored in the near future.

Areas 2 and 3 off the coasts of Louisiana and Texas respectively require no further comment. Some data on the prolific exploration and exploitation of these areas has been given above, and much is well known at present. Production from areas 2 and 3 is chiefly from clastic sediments of Miocene age. These become mingled with limestones toward the south and southwest along the Mexican coast. Production from both clastic and calcareous sedimentary horizons is characteristic of the oil fields in northeastern Mexico, near Area 4. These fields are expected to extend toward the coast. Some geophysical exploratory work has been done in coastal lagoons, and this activity may be expected to extend into the Gulf in the not too distant future.

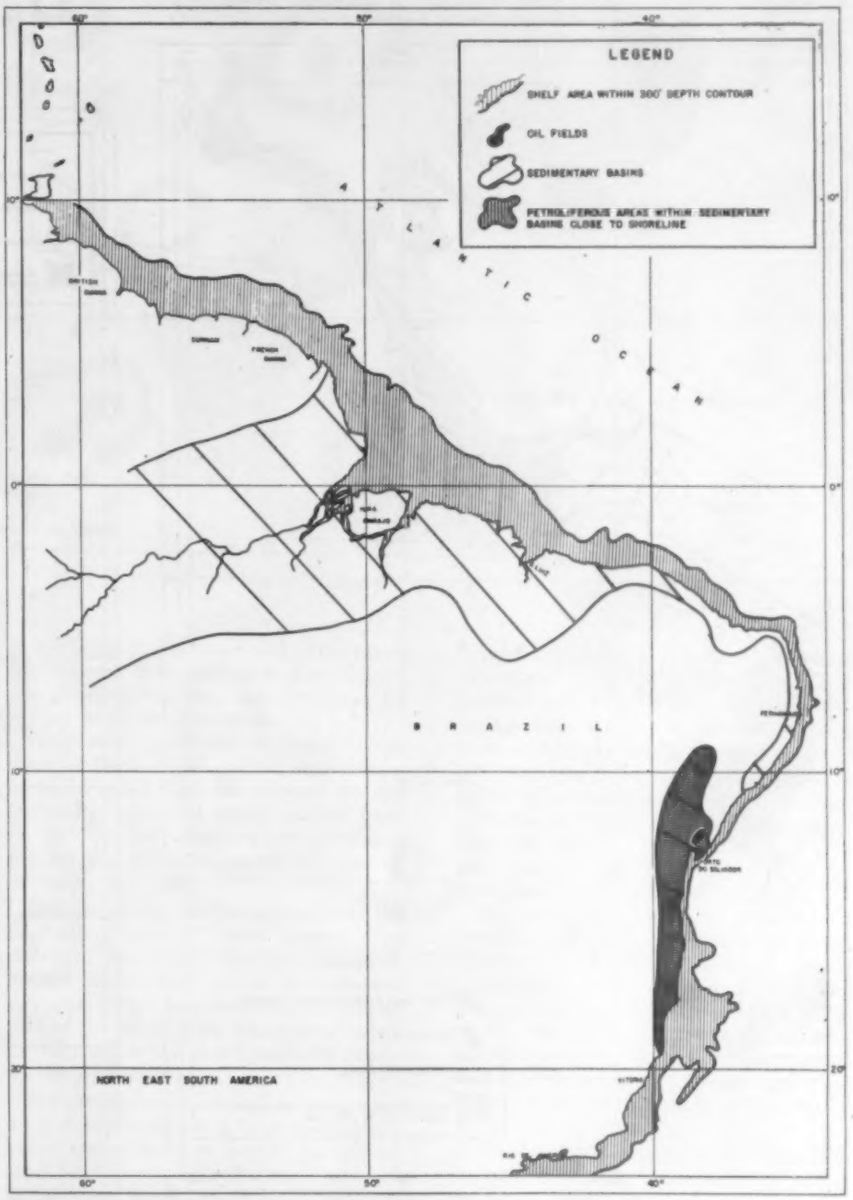
Recent geological and geophysical work done in the region of the "Golden Lane" fields near area 5 suggests that the semicircular reef, from which most of the production comes, may be a part of a circular atoll. If this is the case, it will be necessary to search for the eastern half of the atoll under the shallow sea of the continental shelf off Tuxpan. The above possibility is strongly suggested by the structure of the recently discovered Miguel Hidalgo field, located at the coastline.

Possible future overwater production is further suggested by the location and structure of the new oil fields in Veracruz State. These bear a structural resemblance to U. S. Gulf Coast fields due to their position close to the salt dome province in western Veracruz. The Rabon Grande field is located directly at the coastline, and some geophysical and oceanographic work is reported to have been done along this part of the coast and on the Campeche banks. This area is identified by No. 6, on Fig. 4.

The results of present exploration being conducted in Yucatan have not received any publicity, but it is likely that the known northeast directed structural trends continue under the wide continental shelf area off that peninsula. This area is identified by No. 7 on the accompanying chart, Fig. 4.

Certain areas in Central America have recently been the target of intensified exploration. This is especially true of British Honduras, Guatamala and Spanish Honduras. The continental shelf areas off these countries are identified by Nos. 8 and 9 on the Caribbean chart. Sedimentary basins close to the shore which may be petroliferous, are present in British Honduras and in Guatemala. A large, hitherto virtually unexplored sedimentary basin is situated in eastern Spanish Honduras and in northern Nicaragua. Preliminary geophysical work done in this area is reported to suggest that the basin is continuous under the Mosquito banks. These form an almost uninterrupted bridge of shallow water between Honduras and the island of Jamaica. Recent intensification of the search for oil

*Fig. 7. Index map of northeastern South America.*



ARCTIC OCEAN
BEAUFORT SEA
VICTORIA ISL.
CHUCKCHI SEA
SIBERIA
ALASKA
UNION OF SOVIET SOCIALIST REPUBLICS
SEA OF OKHOTSK
KAMCHATKA
CANADA
MANCHURIA
CHINA
NORTH
UNITED STATES
YELLOW SEA
JAPAN
PACIFIC OCEAN
SOUTH CHINA SEA
PHILIPPINE SEA
HAWAIIAN ISLANDS
PHILIPPINE ISLANDS
FIG 3
FIG 4
TEXAS
CEYLON
SUMATRA
BORNEO
NEW GUINEA
INDIAN OCEAN
FIG 14
AUSTRALIA
SOUTH PACIFIC OCEAN
NEW ZEALAND
ANTARCTIC
75°
90°
105°
120°
135°
150°
165°
180°
175°
135
120°
105°
90°
75°
60°
45°
30°
15°
0°
15°
30°
45°
60°

WORLD PETROLEUM, SEPTEMBER, 1956

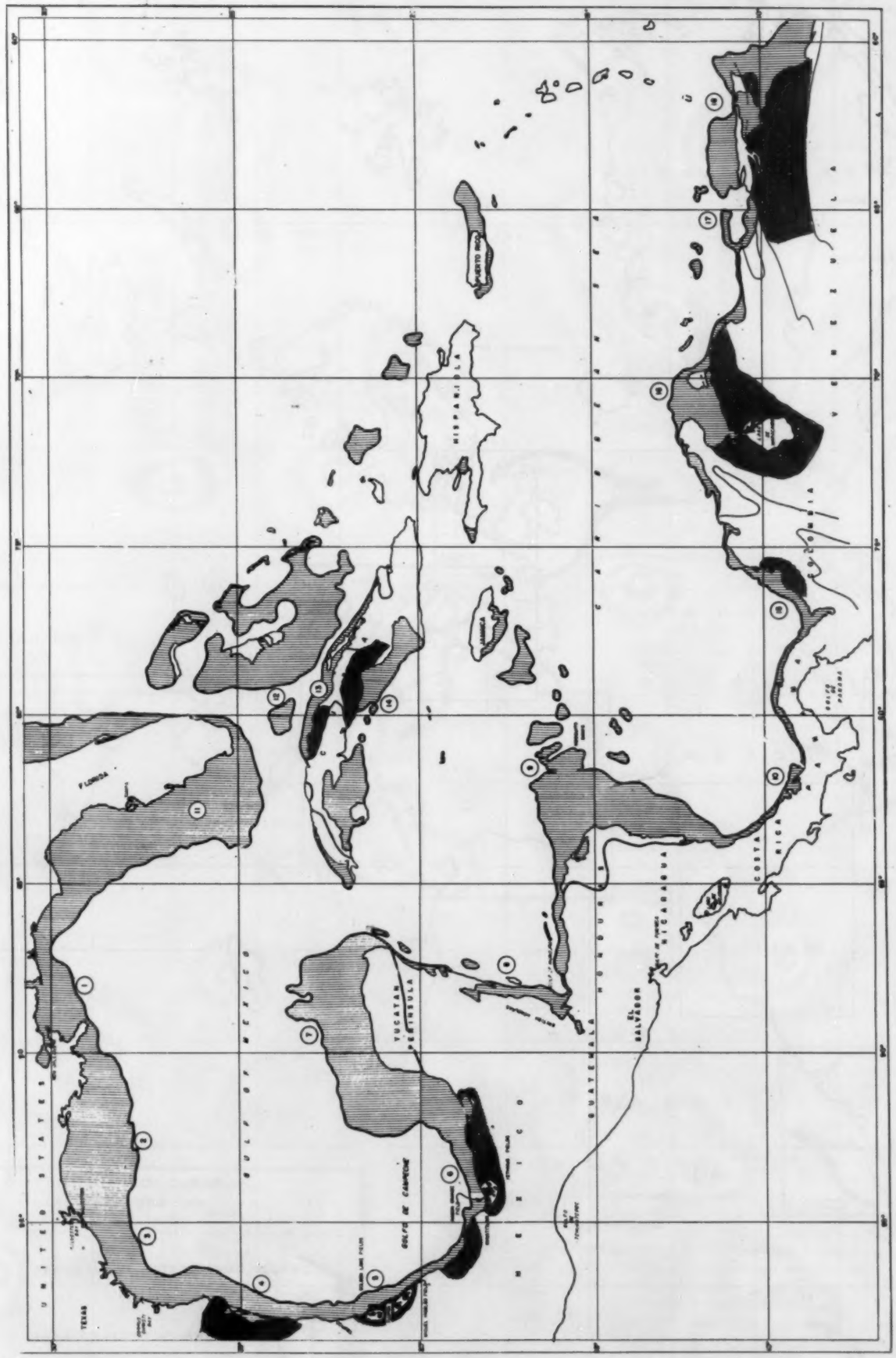



*Fig. 4—Petroliferous areas and continental shelves of the Gulf of Mexico and Caribbean.*

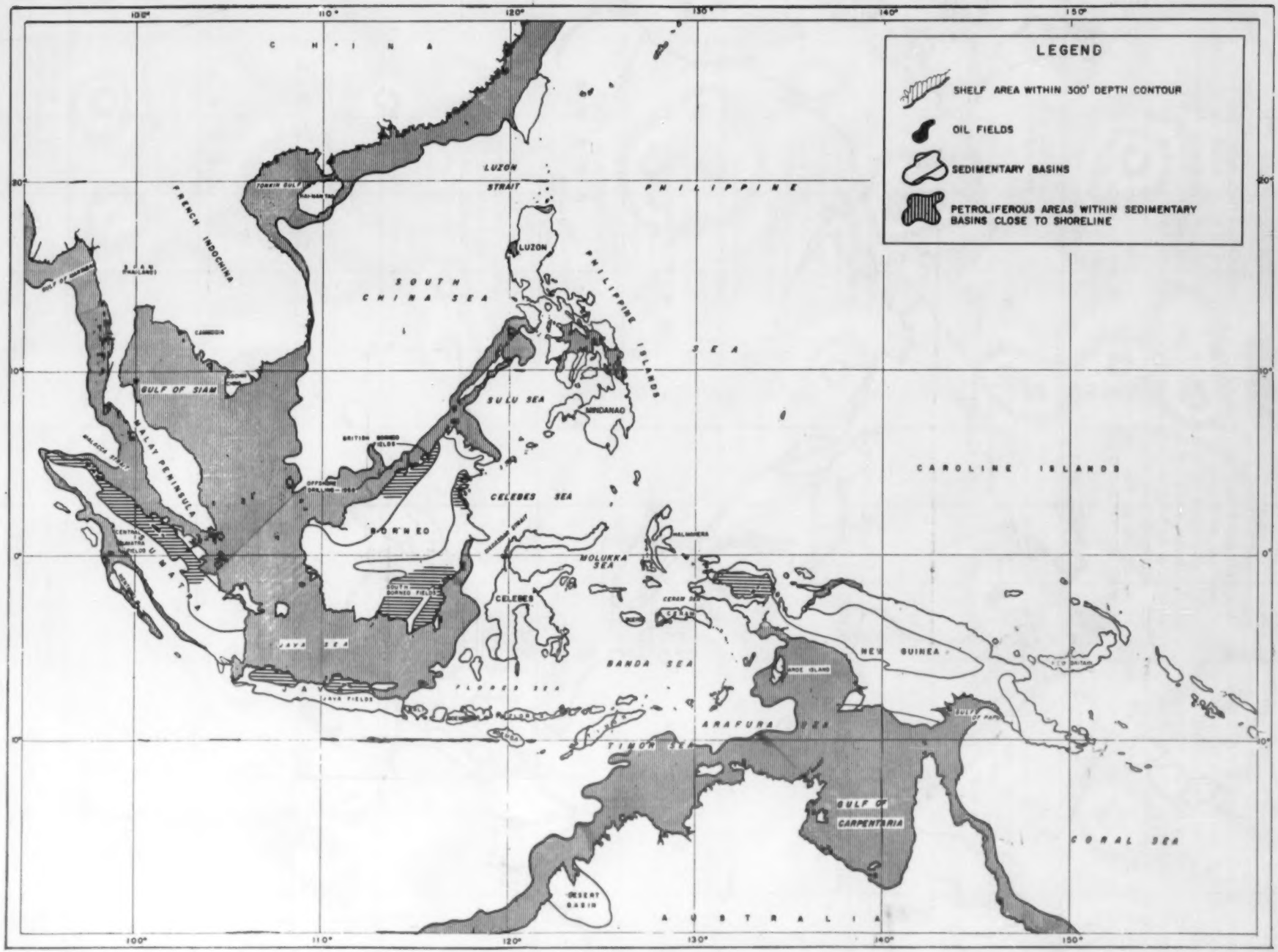



*Fig. 14—Oil areas of the East Indies. Philippines and Northern Australia.*

in Jamaica and in Honduras has focused attention on this large expanse of shallow shelf.

Oil was discovered recently in southeastern Costa Rica in a sedimentary basin believed to continue under the sea. A narrow strip of continental shelf extends from this area, identified by No. 10 on the chart, to the southeast toward Panama.

The east side of the Caribbean is, like the Yucatan Peninsula, characterized by the predominance of limestones over clastic sediments which prevail in the western part of the Gulf of Mexico. Oil discoveries in this limestone area have, however, not yet been as prolific as in Mexico. The chief areas of limestone deposition are located in central and southern Florida, on the Bahama Banks and on neighboring banks and islands, such as Cay Sal. These areas are identified by Nos. 11 and 12 on Fig. 4.

Exploration in these areas is continually expanding, and it is considered likely that petroleum will be discovered here in the future. If this is the case, it will initiate rapid exploration of what may be one of the major marine oil areas in the Caribbean.

A shelf area between an island chain lying along the north coast of Cuba and the mainland is also believed to be promising as a future marine oil province. Two active oil fields, one abandoned field and numerous petroleum and tar seeps attest to the petroliferous nature of the sediments along this part of the Cuban coast. It is identified by No. 13 on the Caribbean chart.

Area No. 14, on the south coast of Cuba, is a wide expanse of continental shelf extending along the entire south and southwest coasts. Recent expansion of the oil fields in Camaguey Province have led major oil companies to acquire large concessions in this marine area, believed to be underlain by petroliferous sediments.

Some of the most prolific oil bearing zones in the entire Caribbean region are situated along the north coast of South America. Many of the petroliferous sedimentary basins in Colombia and Venezuela are located along the coast, and some are definitely known to continue beneath the continental shelf. This is rather wide in certain parts, notably off the sedimentary basin in Colombia, (area No. 15) the Gulf of Venezuela region, (area No. 16) and the shelf zones in eastern Venezuela, (areas 17 and 18). The Gulf of Paria, between the coast of Venezuela and the island of Trinidad (area 18) is presently being explored by geophysics and offshore drilling.

Most important among the oil fields in

*Fig. 8. The southwestern coast of South America.*

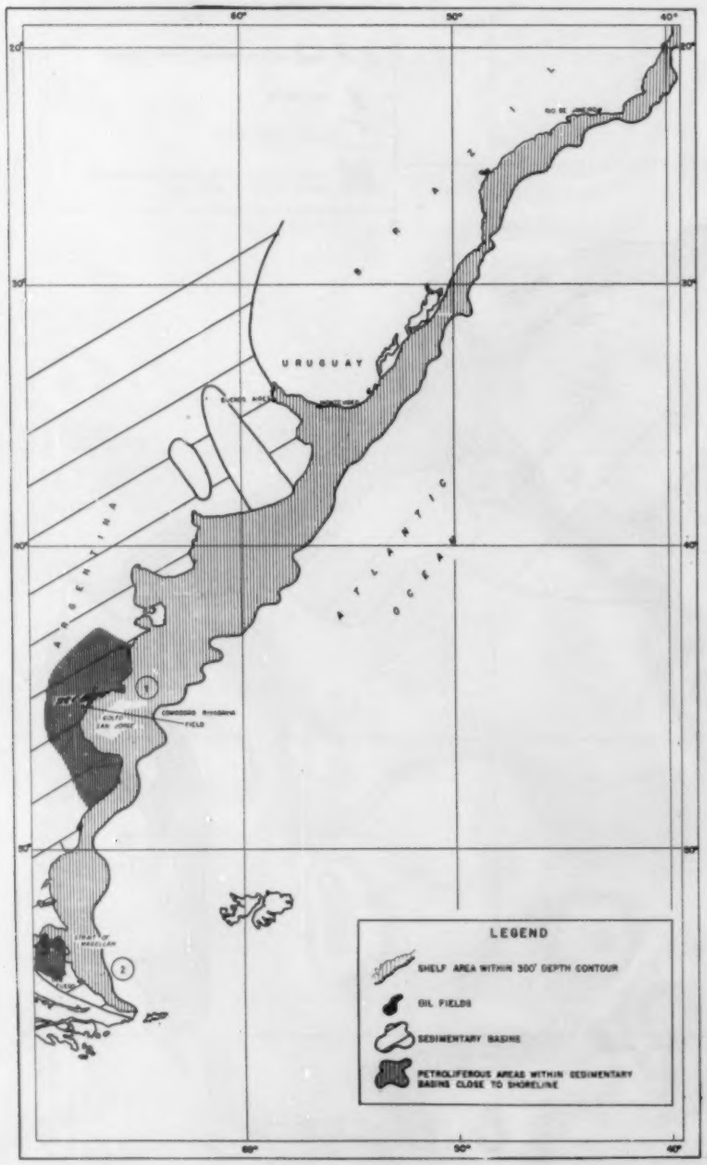
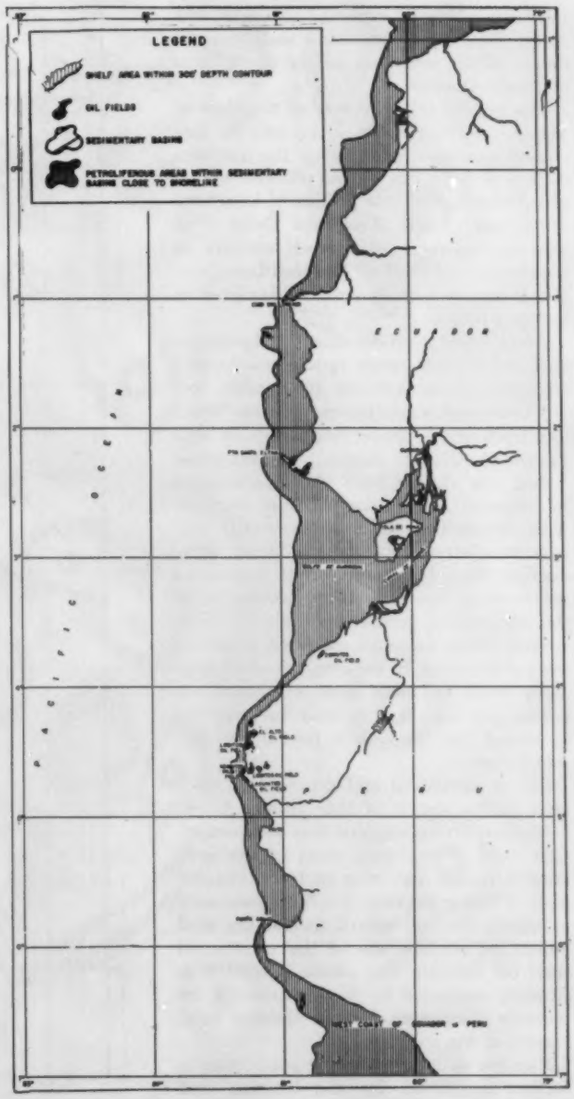



*Fig. 9. The west coast of South America in Ecuador and Peru.*



western Venezuela are those situated around the Lake Maracaibo basin. The most prolific production in fields on the west side of the Lake is found in Cretaceous limestones, which are overlain by three more possible producing horizons in clastics of Eocene and Oligocene-Miocene age. These fields lie on northeast-aligned structural trends. It is very likely that these may continue under the western part of the Gulf of Venezuela, and it is believed that this marine area will see intensive exploration in the near future.

Relatively little exploration has been done in north-central Venezuela, but it is believed that the producing horizons found in the Quimare and Cerro Pelado Fields will be traced to the north. The north edge of the East-Central Venezuelan sedimentary basin swings out to sea north of Barcelona. Since many of the productive fields of east Venezuela are situated near the north edge of the basin, it is believed that marine oil fields may be located by exploration in this area, identified by No. 17 on Fig. 4.

The oil fields of eastern Venezuela are situated in a sedimentary basin whose axis strikes in an east-west direction. The north edge of this basin appears to be coincident with that of the petroliferous basins on the island of Trinidad. Structural trends of the principal east Venezuelan near shore fields, Quirquire, Guanaco and Pedernales, are also directed to the northeast. This, in conjunction with the structural trends of the fields in Trinidad, suggests excellent exploration possibilities for marine oil reserves in the Gulf of Paria. Some overwater drilling is presently being conducted in the Gulf of Paria off the southern shore of Trinidad. This has been spurred by recent improvements in the Trinidad tax situation favoring marine drilling.

Good geological evidence, aided by some geophysical data, suggests that the east Venezuela sedimentary basin continues on the continental shelf off the coast of British Guiana, and that the same stratigraphy may be found here. The southern edge of the basin lies just inland from the shoreline, and limited exploration has taken place here. It is believed, however, that the petroliferous formations found in the east Venezuelan basin continue under the shelf.

The stratigraphy of some of the oil producing districts of South America is listed on Fig. 6 The petroliferous formations are identified as on the other correlation charts. Fig. 7 shows the northeastern part of South America including the Guianas, the Amazon River Basin and most of Brazil. Most of this part of South America is characterized by the presence of a wide expanse of continental shelf. This attains a width of over one hundred twenty miles off the mouth of the Amazon River and narrows toward the southeast. The Amazon River Basin in Brazil is productive in its upper part, but has not been explored sufficiently to evaluate possibilities in the area near the coast. It seems very likely, however, that the same petroliferous formations may be found near the coastline,

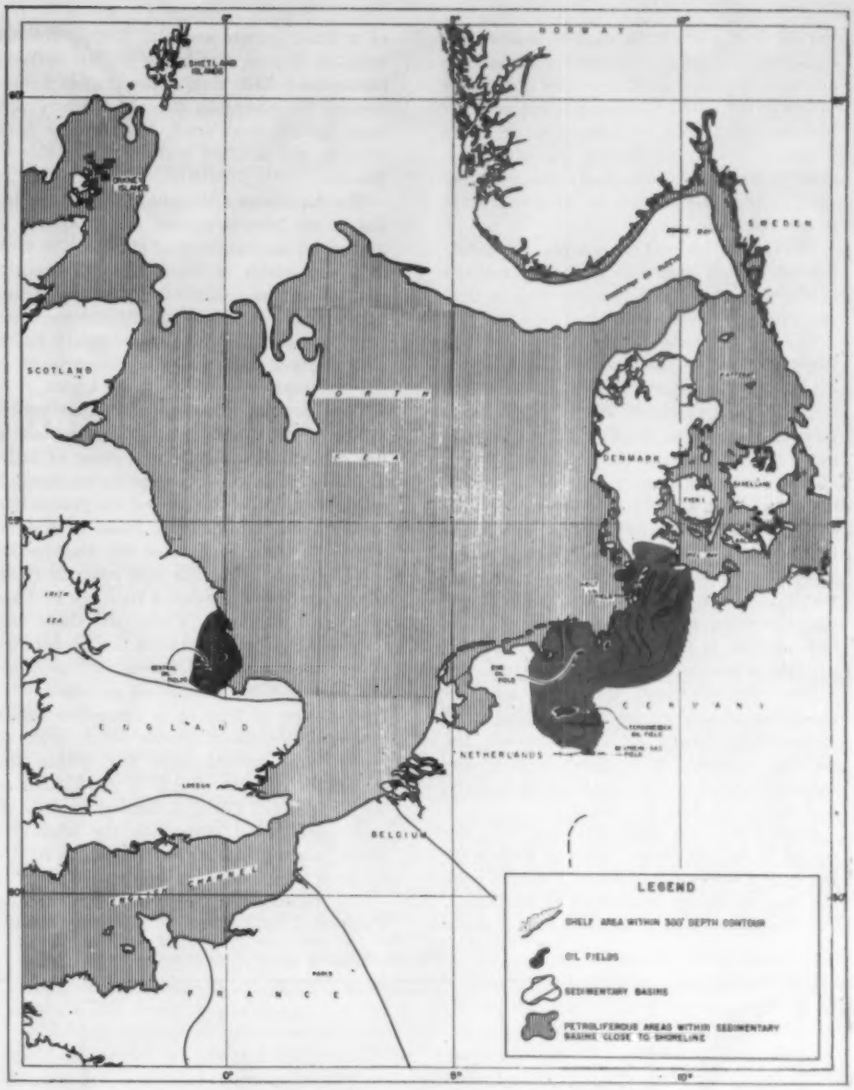



*Fig. 10. Sedimentary basins of the North Sea area.*

as are found in the upper part of the basin. The Amazon River and some of its numerous distributaries have been explored by marine geophysical methods.

Near shore production is found in the State of Bahia in an isolated sedimentary basin elongated along the shore of the Atlantic. Production of oil is obtained from the fields of the Reconcavo area surrounding the Bay of Todos Santos at Porto de Salvador.

The continental shelf at a point near the productive fields is quite narrow. The width of the shelf increases, however, toward the southern end of the sedimentary basin. This may indicate that a large part of the basin is on the shallow continental shelf at this point, implying future marine oil possibilities.

The southeastern coast of South America is shown on Fig. 8. A large sedimentary basin lies adjacent to a wide continental shelf in Argentine. Production from part of the basin is obtained at the Comodoro Rivadavia Field. This is located just inland from the shore of the Golfo San Jorge. It is believed that this marine area, in immediate juxtaposition to a petroliferous sedimentary basin, will be explored in the near future to form Argentine's first marine oil province. A gas field is located on Argentine territory in Tierra del Fuego near the southern tip of South America. This also is close to a shelf area. The location is indicated on the chart, south of the strait of Magellan.

The only Chilean oil field close to the ocean is also located on Tierra del Fuego near the shores of Magellan Strait.

Favorable conditions for marine oil exploration are found in Ecuador and Peru, on the west coast of South America. This area is shown on Fig. 9. Petroleum production in Peru has for many years come from fields situated at the shore of the Pacific Ocean.

The continental shelf in the immediate vicinity of the Peruvian fields is rather narrow, but this widens to a great extent to

the north and south, in an area believed to lie within the same sedimentary basin. The greatest extent of shelf area lies in the bay to the north of the Peruvian fields and between them and near shore oil fields in Ecuador. It is believed that this area may, next to Venezuela, constitute the most favorable zone for marine oil exploration, in South America.

Increasing interest in marine oil possibilities is also shown in Europe. Emphasis is placed on the North Sea, the Bay of Biscay and the Mediterranean.

The North Sea is shown on Fig. 10 which illustrates the relative position of oil-productive sedimentary basins in northern Germany and England. These may be continuous under the North Sea which is in most parts less than 180 feet deep. Many of the north German salt dome oil fields are located on structures oriented towards the sea. This is especially true of the Heide fields near the German-Danish border, which lie on an anticlinorium striking directly into the German Bay off Hamburg. Some marine exploration has been done here and it is understood that overwater drilling is planned for the near future.

The Mediterranean area and adjacent countries are shown on Fig. 11. The chief sedimentary basins in this zone are the Aquitaine Basin in southern and southwestern France, the Po River basin in Italy, and the north African areas.

Attention of oil geologists has been directed to the Aquitaine basin in France by the recent discovery of oil at Parentis near the Bay of Biscay southwest of Bordeaux. The Parentis Field is located at the shore of a tidal lagoon and the first overwater wells in Europe are being drilled in Lake Biscarosse. The field may be expanded toward the shore in the near future and some geophysical work has already been done in the shallow waters of the Bay of Biscay.

The Aquitaine sedimentary basin continues to the Mediterranean and is known to extend on the continental shelf of the Gulf of Lyons south of Marseilles. The southeast end of the sedimentary basin of Aquitaine merges in this area with the southern extension of the Rhone sedimentary basin, which serves to increase the importance of the marine area in the Gulf de Lyons.

The greatest expanse of shallow water in the entire Mediterranean is located in the Adriatic Sea on the east coast of Italy. This shelf area gains in importance through its position close to gas and oil production in the large sedimentary basin of the Po River. A wide portion of the continental shelf extends along the east coast of Italy, where oil was discovered recently at Pescara. This discovery is near the shore and further serves to emphasize the importance of the continental shelf area in the Adriatic as a possible marine oil province.

The same is true to a somewhat lesser extent of the shelf on the south coast of Sicily. This marine area lies within the sedimentary basin which is productive at the Ragusa Oil Field. A limited expanse of continental shelf surrounds the island of Malta, located directly to the south of the oil producing basins in Sicily.

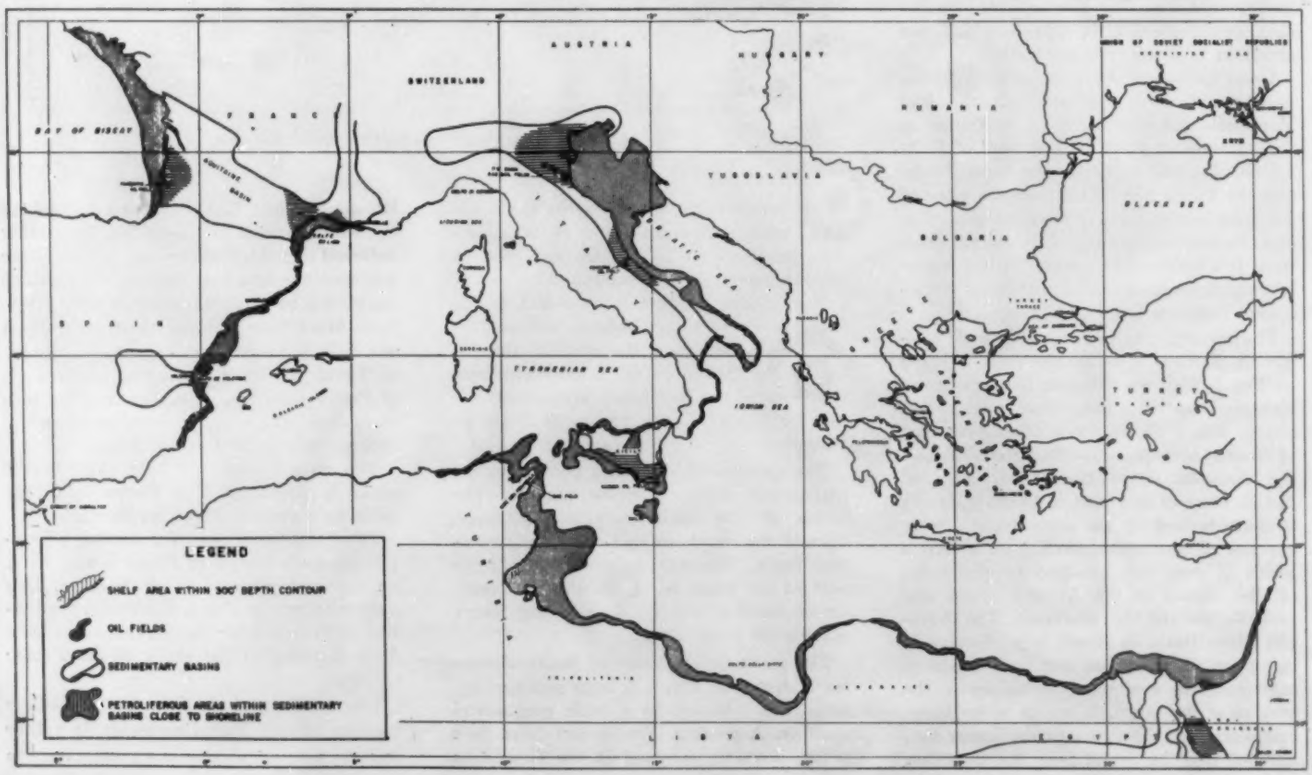
The recent discovery of oil near the Tunisian-Libyan border and the subsequent contest for concessions in these countries has called attention to the continental shelf along the north coast of Africa. Several American oil companies hold offshore concessions in Egypt as well as in Libya. The greatest expanse of continental shelf along the coast of North Africa is situated in Tunisia. Production of natural gas on the Cape Bon Peninsula lends increased importance to this region. Some geophysical work is reported to have been done in this offshore area with encouraging results. Marine seismic exploration is also planned for Egypt, whose oil industry is beginning to explore the Nile Delta and the shelf beyond it. It is reported that structures of considerable magnitude have been found during the course of geophysical exploration along the North African coast.

Egypt's Sinai Peninsula has seen considerable exploration lately and four oil fields are located on the northwest shore of the Gulf of Suez. All parts of the Gulf of Suez are less than 300 feet deep, and it is probable that the sedimentary basin which is petroliferous on the Sinai Peninsula and also on the African mainland is continuous under the Gulf of Suez. Three oil fields situated on the African coast of Egypt are the Ras Gharab, the Gemsa and the Hurghada field. Considerable areas of shallow water are found off the Ras Gharab, and the Gemsa fields in the Red Sea.

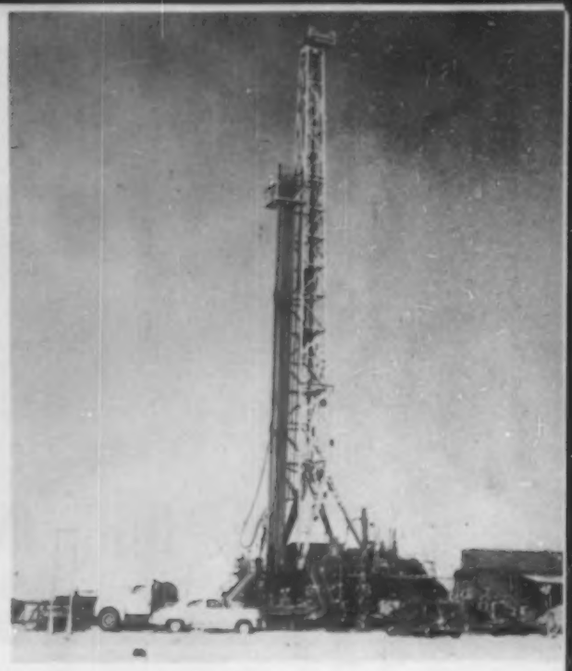
The discovery of oil close to the coast of Israel has initiated speculations regarding the possibilities of exploration for petroleum on the continental shelf off the Mediterranean coast of this country. The Is-

*Fig. 11. Oil fields of the Mediterranean coastal areas.*

(*Continued on page* 108)



*Production from the Kuwait-Saudi Arabia Neutral Zone is to be more than tripled in the near future to about 100,000 b/d. To accomplish the increase, wells are being completed from all three of the producing horizons in the field and spacing is being reduced. Much of this increase is called for by heightened demand for Neutral Zone crudes, especially in Europe where heavy fuel oil use is rising rapidly.*



*A U-15 Unit rig at site of Wafra No. 4.*

# Neutral Zone Production to Grow

**By E. Lawson Lomax**

There are two Neutral Zones adjoining Saudi Arabia, the boundaries of which have not been determined. That between Iraq and Saudi Arabia has not been explored for petroleum, but the zone between Kuwait and Saudi Arabia is now producing territory.

American Independent Oil (Aminoil), owned jointly by Phillips Petroleum Co., Hancock Oil Co., Signal Oil & Gas Co., Ashland Oil and Refining Co., Ralph K. Davies, J. S. Abercrombie, Sunray Oil Corp., Deep Rock Oil Corp., Globe Oil and Refining Co. and Lario Oil & Gas Co., is one of the two operators in this part of the zone. Aminoil's concession covers all of the Sheikh of Kuwait's interest in this Neutral Zone and its territorial waters, totaling about 1,190 square miles. The concession expires in 2008.

Pacific Western Oil Corp. (Now Getty Oil Co.) holds a similar concession to the above which covers all of the King of Saudi Arabia's interests in the Neutral Zone.

The companies operate jointly, although Getty Oil Co. has now launched its own drilling program.

At the time of the writer's visit to the Neutral Zone, under the auspices of Aminoil, all the production and exploration work in the Neutral Zone was being done by arrangement with Getty Oil Co. Royalties from production are shared equally by the Sheikh of Kuwait and King Saud of Saudi Arabia.

Aminoil exports half of its production through its own terminal at Mena Abdulla in Kuwait. The other half is taken by Pacific Western and exported through the terminal at Mina Saud, which is in the Neutral Zone.

Aminoil's first experiences in the Neutral Zone were far from promising as only a little over three years ago, after intensive geological and geophysical surveys, they had drilled several test wells and had obtained no production. One outside geological source expressed the opinion that no caprock existed to hold the oil in formation, and it had all been dissipated. Shortly after this time however, oil was struck and since then 32 producing wells have been drilled.

The thirty-third, named E.E.W.2 is in process of drilling and preparations are being made to drill Well No. 34. The production is averaging about 30,000 b/d of sweet crude, with a little salt content and no water.

There are three production zones in the field. The shallowest, at a depth of about 1,200 feet, produces a very heavy bituminous crude, very similar in quality to the early Mosul crude. Experiments are being carried out on the mixing of this with crude from the middle zone for export.

The middle production zone has an average depth of about 3,400 feet, and it is from this zone that the main portion of the present production is obtained. It consists of sandstone, similar to the Burgan sands, with a water drive.

A further production zone from limestone has been struck at about 6,700 feet. This zone is not being produced at present but preparations are being made for drilling wells in the future down to this zone and producing from all three. The well spacing on the field is about one eighth of a mile apart.

Aminoil's loading terminal lies about two miles offshore, to which it is connected by a 22-inch submarine line. At the sea end of the line there is a 14-inch flexible hose, connecting to 8-inch loading hoses on the tanker deck.

There are three terminal storage tanks in use, with a fourth one in an advanced stage of construction by C.A.T. the Bustani Contracting firm. Loading from these tanks is through three single stage direct coupled diesel motor driven centrifugal pumps and a standard rate of loading is 1,000 tons (about 7,000 barrels) per hour.

Aminoil's staff is housed in an air-conditioned, tank-landing craft, which has been altered and adapted for the purchase, providing ample sleeping quarters, a large combined dining hall and recreation room, with a well-appointed galley. This landing craft is anchored in a sheltered bay off the Persian Gulf. Offices, stores, workshops, etc., are located ashore, close to the living quarters.

Since the writer's visit, Getty Oil Co. have made arrangements to start a drilling program for more rapid development of the field and particularly of the deep Ratawi zone which was discovered by Aminiol. The target for increased production by the two companies is 100,000 b/d, all three zones being used for the production.

Production from the Kuwait-Saudi Arabia Neutral Zone is to be more than tripled in the near future, to about 100,000 b/d. To accomplish the increase wells are being completed from all three of the producing horizons in the field and spacing is being reduced. Much of this increase is called for by heightened demand for Neutral Zone crudes, especially in Europe where heavy fuel oil use is rising rapidly.

END.

*Converted LSTM/V Aminoil, moored in Khor at Mufatta, where it serves as camp and warehouse.*

*On August 1 drilling rigs were operating at 1,106 locations in the free world outside the United States. More than 50 independent producers recently have joined the rush to obtain exploration rights in odd corners of the world. It all adds up to an . . .*

# ALL-TIME HIGH IN WORLD DRILLING AND EXPLORATION

Oil men are exploring oil possibilities in nearly every remote corner of the world, many going outside their home country for the first time. Where the companies cannot invest in concessions on their own account, as in Brazil or Chile, drilling contractors often can find profitable employment. Drillers have made nearly every sort of arrangement, with some of them participating in production or owning a share in the producing company but most operating under regular contract.

Rigs were operating on August 1 in 55 different countries outside of the U. S. and the Russian bloc, operations totaling 1,106 set a new world's record.

In Venezuela the prospect of new concessions has aroused interest on the part of many independent, as well as major, companies. In addition to the companies already represented in Venezuela, many new independents participated in the recent bidding which opened new areas in Venezuela for the first time in 10 years. Among the new companies which received acreage in the recent Lake Maracaibo sale were Sun Oil Co., Signal Oil and Gas Co., Hancock Oil Co., Sohio Petroleum Co., and Pure Oil Co. (through Barinas Oil Co.) The Japanese firm of Teikoku Oil is also expected to enter a bid for concessions.

Several companies plan to enter bidding at some future date, one of which is Venezuelan Leaseholds S.A., a subsidiary of Venezuelan Leaseholds Inc., of Nassau, Bahamas. The companies which are associated with Venezuelan Leaseholds are Boger Oil Co., Star Falcon Oil Co., and Dade Petroleum Co.

Another company, Inversiones Venezolanas S.A., will include U.S. independents but not all are known as yet. Sinclair Oil Co., Richfield Exploration Co. (Standard of California), and a company reportedly controlled by Clint Murchison of Dallas, Murmac Oil Co. de Venezuela, are also interested.

The established companies in Venezuela, such as Creole Petroleum Corp., Mene Grande Oil Co. and Cia. Shell de Venezuela, are also represented but they have been joined by others, including some companies from Germany, Spain and France. Among the latter is Deutche Erdol A.G. from Hamburg, Cia. Iberica de Petroleos from Spain, and Inversiones Venezolanas S.A., from France. From the United States, such companies as Union Oil Co. and Phillips Oil Co. are represented. One group of independent companies, operating under the name of American Venezuelan Independent Oil Producers Assoc., has received two concessions in Lake Maracaibo.

There were 128 rigs running August 1 in Venezuela, of which 69 were in eastern and central parts of the country. Loffland Brothers are active contractors with 19 rigs running. Santa Fe Drilling Co., has five rigs, D & D Drilling Co., four, Delta Gulf six, PYS five, Pantepec three, and Brown Drilling two. The remainder are company rigs.

Although Pemex' hold on the Mexican petroleum scene is nearly complete there is considerable exploration under way by various companies under production-payment contracts. Cities Service is continuing operations under its 1948 exploration contract covering about one million acres. CIMA, the Cia. Independiente Mexicana-Americana, S.A., has been carrying on drilling operations over several areas since the contract was concluded in 1949. CIMA is owned by American Independent Oil Co., Signal Oil and Gas and Edwin Pawley. Recently the Belgian firm of Petrofina bought an interest in the company.

Another company operating in Mexico is Sharples Oil Corp. of Denver, exploring through its Mexican subsidiary, Sharmex, S.A. Independent Exploration Co. and Edwin Pauley hold an interest.

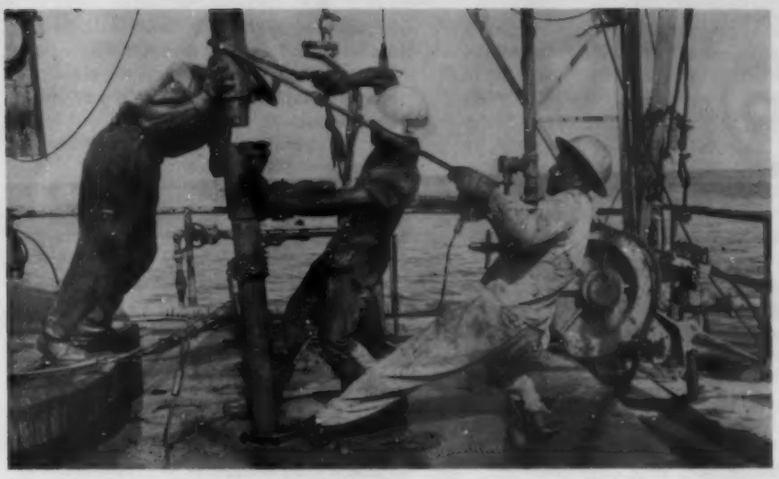
The contracts under which these companies operate call for repayment through production found, if the exploring company is successful. The potential profits under this type of arrangement are considerably lower than would be expected in a "normal" foreign venture, and no major companies have re-entered Mexico since the 1938 ex-propriation, although talks with several of the majors have been held at various times in recent years.

On August 1, 1956, 95 rigs were active in Mexico and of these 84 were operated directly for Petroleum Mexicanos, and six were drilling contractors to Pemex. Under the special production repayment contracts there were five rigs going, one for CIMA, one for Isthmus Development Co., two for Sharmex and one for Dixon Drilling (Pauley interests).

Central America is seeing a revival of exploratory activity. Foremost in exploratory interest, if not in actual operations yet, is Guatemala. There the passage of a new oil law last year brought applications from 29 companies. The total of applications was surprising, in view of the comments heard earlier about the severity of the new petroleum law, and the government had to shut off further applications until overlaps could be settled, particularly in the best potential area, the Peten, near Mexico, where most of the companies requested acreage. The government adopted an eligibility ruling based on experience and resources of applicants and admitted the following companies: Signal Exploration Co., Tidewater Guatemala, Ltd.; Ohio Oil Co. of Guatemala; Sohio Caribbean Co.; Continental Oil Co. of Guatemala; Amerada Petroleum Corp. of Guatemala; Petroleum Investments (Overseas) Ltd., which is owned by the Shell Group; Texas Petroleum Co.; Union Oil Co. of California; Esso Standard (Guatemala) Inc.; Sun Production Co.; Cia. Petrolera California, owned by Standard Oil Co. of California; Jaime Allan Willard Duran, backed by Husky Oil Co., an independent from Cody, Wyoming; Petroleos Guatemaltecas, which is controlled by Santa Fe Drilling Co.; Central American Oil and Mining Co.; Seaboard Exploration Co.; Bandini Petroleum; Story J. Sloan of Houston; Antonio Molina Murillo; and Petroleos Atlas de Guatemala. The first of these companies (Signal) was ruled eligible to receive concessions last June. The latter five were ruled eligible for 15.3%, 67.7%, 64.6%, 12,350 acres, and 25.8% of requested area respectively.

Seven other companies were ruled ineligible for concessions. They include Archer Oil, Cia. Petrolera Guatemalteca, Shawano Development Corp., Norman Stone of Houston, A. K. Swann of Indiana, Halbert and Jennings, and Garfield and Pasternak of Denver, Colorado.

Two of the larger companies drilling in Central America are being closely watched as they conduct deep tests. British Honduras Gulf Oil Corp. is drilling its second deep test in British Honduras with Santa Fe Drilling Co. as operator. The first well,



*Venezuelan drillers operating in Lake Maracaibo. (Photo courtesy of Creole Petroleum Corp.)*

*Exploration in Colombia is rising. Shown is a wildcat well drilling near Barrancabermeja.*

Yalbac No. 1, was dry at 9,005 feet several months ago. The rig was moved and a second well spudded, named Hillbank No. 1, a few miles away at 17°38′ North, 88°40′ West. No results are being released on this well. Its outcome could have an important effect on Guatemalan prospects.

Cia. Petrolera de Costa Rica, owned by Union Oil Co. of California, is drilling its fifth Costa Rican exploratory well, Cocolas No. 2. Loffland Brothers are the contractors. Cocolas No. 1, nearby and located only about half a mile from the border of Panama, had oil shows early this year and touched off a wave of leasing activity in the Bocas del Toro basin, which extends through this area and Panama.

One of the more unusual companies entered the petroleum field during July when Consolidated American Industries obtained a 2,240,000-acre concession on the Caribbean coast near Union's discovery. The company holds various enterprises including insurance companies and household goods manufacturing enterprises but this is its first entry into oil exploration, so far as is known.

Another company, Cia. Petrolera del Golfo del Darien, which is controlled by World Commerce Corp. of New York, recently gave a farmout of its 10 million acre concession area to International Oil and Metals. The latter acquired 75% interest in the concession in exchange for drilling an exploratory well in central Darien province of southeastern Panama this fall. International has small holdings in the western United States but is a California company which has never operated outside the United States before.

In Nicaragua exploratory drilling is expected to begin shortly on concessions held jointly by Joseph K. Coney, San Francisco tanker owner, and Miguel d'Escoto, Nicaragua's Ambassador to Italy. The government is currently working on a new law and no new concession applications are currently being accepted.

In Jamaica a Canadian company, Base Metals Mining Corp., obtained a concession some years ago and drilled an initial well which obtained encouraging shows. The concession has since been farmed out to Stanolind Oil & Gas Co., which is currently drilling an exploratory well.

In Puerto Rico a Texan, Frank R. Crerie of Houston, has applied for concessions covering 49 units of 64 hectares (158 acres) each, for a total of 7,746 acres. The concessions are not yet final, and contracts are still awaiting approval of the government's Mining Commission, as well as the governor of Puerto Rico and Mr. Crerie.

In Honduras a concession held by Cia Petrolera Hondurena is showing increased activity. The 48-million acre concession was originally obtained in 1955 by a group of Texans, headed by the late John L. Sullivan, president of Texon Drilling Co., and Sullivan and Garnett, of Corpus Christi. Recently an interest was sold to John W. Mecom, with Ernest Cockrell, Jr. and associates of Houston. A well is currently drilling.

Another Texas oil man recently obtained a concession in Honduras. Lester Foran Oil & Gas Co., Corpus Christi, Texas, received 10.3 million acres in the departments of Olancho, and Santa Barbara.

Mr. Mecom is active in other countries as well, having a concession in Haiti which covers the entire country. The concession was originally obtained by Commonwealth Oil Co. of Houston and 75% interest subsequently was transferred to a syndicate headed by Mark E. Andrews. Half interest in this was subsequently transferred to Mr. Mecom.

In Colombia the Mecom interests have recently signed an agreement for exploration of an offshore area near Tolu. Another American company, Forest Oil Corp., has negotiated a contract with the government for water injection work in the De Mares field. This latter company recently concluded an exploration agreement covering all of Cyprus in the Mediterranean and attempted to conclude an agreement for a concession over the Mahra, a small sultanate adjoining the Dhofar concession in Southern Arabia held by Cities Service Co. Cities Service has also concluded a contract in Colombia, covering about 2,200,000 acres held by the government's Empresa Colombiana de Petroleos in the El Carare region, surrounded on three sides by a major Colombian producing area, the De Mares concession.

Twenty rigs were active in Colombia on August 1. Of these 17 were working for Socony, International, Shell, and The Texas Co., and three for the government's Empresa Colombiana.

Passage of a new oil law in Bolivia revived interest in that country. Previously, however, a Texas independent operator, Glenn McCarthy, obtained a concession in the vicinity of Los Monos and found production. With the passage of the new law in early 1956, Gulf Oil Corp. entered Bolivia and brought in three independents. They are William Bros., pipeline constructors who have done all construction in Bolivia to date, Falcon Seaboard Drilling Co., and Barry & Reiner, Inc.

Recently it was announced that California Exploration Co. (formerly Richmond Petroleum Co.), an exploration subsidiary of Standard Oil Co. of California, had begun negotiations with the government. Socony Mobil, Pure Oil Co., Richfield Oil Co., Standard Oil Co. (Ohio) and International Petroleum Co. are also reportedly interested.

In Ecuador a new exploration concession has been received by Manabi Exploration Co., on the Santa Elena peninsula. Manabi is controlled by Pantepec Oil Co. of Texas. Nine rigs were operating in Ecuador as of August 1, of which seven were for Anglo-Ecuadorian Oilfields and two for Manabi.

Peru, which saw a large upsurge of activity with the passage of a new oil law in 1952, has independents from Canada, the U. S. and local companies. El Oriente, a local Peruvian company which has an operating agreement with three German firms, has recently received 425,000 acres of land in the Montana region of Peru, in company with such large companies as Texaco, Richmond (Standard of Cali-

tornia), Cities Service, Socony Mobil and Jersey Standard.

A U. S.-owned company which has formerly restricted itself to mining entered the Montana when the Cerro de Pasco company requested and received additional acreage. Another independent, Skiles Oil Corp. from the U. S., has also requested concessions in the Montana region totaling about 500,000 acres. A Canadian-held oil company, the Peruvian Oils and Minerals Ltd., has recently been in the news when its claim to a concession in Peru's Montana region was disputed by Ecuador as lying within a disputed border area. The company said the concession represented only a small part of its holdings and due to transportation difficulties the delay was not important at present. This company, plus a U. S. independent, Trans-Western del Peru, owned by Western Oilfields, Inc. of Denver, did not receive the maximum amounts in the recent Montana bidding. Petroleo Sullana, Ltda., owned 40% by Union Oil Co. of California, was also represented in the Montana bidding. Petrolera Peruana, headed by H. Lamotte Gildemeister of New York, has concessions in this area as well.

Established production in this difficult operating area was recently obtained by three independent American companies, when the Ganso Azul properties were purchased by Texas Gulf Producing Co., which holds 80% of the stock at present, Kendall Refining Co., of Bradford, Penna., and Bay Refining Corp., of Saginaw, Mich., each of which own 10%.

An unusual company in Peru is the U. S. heavy equipment manufacturer, Le Tourneau, exploring through Corp. Le Tourneau del Peru, Inc. This company has acreage in the Montana region. Douglas Oil Co. from California has the distinction of having achieved production in Peru's Sechura Desert area, where over 16 wildcat wells have ben drilled in the past three years without success.

As of August 1, some 20 rigs were running in Peru. Six were operating for Lobitos, one for Cia. "El Oriente", one for Cia. Petrolera Peruana, two for the government's Empresa Petrolera Fiscal, six for International Petroleum Co., one for Ganzo Azul, one for Peruvian Pacific Oil Co., and two for The Texas Co.

In Brazil operations are a monopoly of Petrobras, but private capital is working under contract. There were 28 rigs running on August 1, of which 18 were being run by Petrobras and 10 by Drilling and Exploration Co. for Petrobras' account.

Elsewhere in Latin America the government has mostly pre-empted petroleum exploration and development. Argentina has 48 rigs running as of August 1 but most of them (42) were working for YPF, the government's company. One was working for Jersey Standard's subsidiary, two for Astra and three for Diadema companies. These companies are restricted to their old acreage.

In Uruguay the U. S. firm of Haney and Williams is drilling with one rig for the government. Santa Fe Drilling Co., has six rigs running for the government in Chile as of August 1.

Considerable activity is underway in the Caribbean, where independent companies have made a promising discovery in Cuba. During July, 1956, Cuban-American Drilling and Exploration Co., Dallas, brought in a well producing about 800 b/d from the Lower Cretaceous initially. It later fell to 25 b/d. The well is located about two miles south of the town of Jatibonico in Cabaguey Province, where the initial strike was made in Cuba, setting off the exploratory boom two years ago. Cuban-American has a 50% interest in the well, the remainder is shared 25% each by Trans Cuba Oil Co. and Cuban Venezuelan Oil Voting Trust. Such major companies as Stanolind, Shell, Gulf, Jersey Standard, and Standard of California, are represented in Cuba now, but the main exploratory play continues in the hands of the independents. In addition to the companies cited the operators include Siboney Development and Exploration Co., Perla Negra Oil Co., Cuban Colombian Oil Co., Americuba Petroleum Corp., Benedum & Trees, Russel Cobb, Jr., Ted Jones Oil Enterprises, Canadian Astoria Mineral Ltd., Lee Oil Co. of Chicago, and Reiter-Foster Oil Corp. with Union Oil Co.

In Trinidad 27 rigs were running on August 1, four of them for Antilles Trinidad Oilfields, four for Apex, one for Dominion (Standard of California's exploration company), one for Kern, eight for Trinidad Oil Co. (which has been sold to The Texas Co.), five for Trinidad Petroleum Development Co., three for United British Oilfields and one for International Brown Drilling Co. The only independent reported considering entry into Trinidad is Colorado Oil and Gas Co., Denver, which is considering purchase of a local Trinidad company.

In the Eastern Hemisphere the tide of independents has reached most of the major countries. In England British Petroleum continues its long hunt for domestic production, but is being ably assisted by other and smaller companies. Licenses for exploration are held by several other companies, including Steel Brothers, and Imperial Chemical Industries, Ltd. Esso is also involved in the search. Among the rigs operating in the company during August was one by John Thom and Co., six by D'Arcy Exploration (British Petroleum's exploration subsidiary), and two by the Gas Council, also a British Petroleum affiliate.

Of the total of 29 rigs operating in France, eight are being run by Regie Autonome des Petroles, four by Ste. National des Petroles du Languedoc Mediterranean, two by St. Forex, six by Ste. Pechelbronn, two by Esso Standard, six by Ste. Nationale des Petroles d'Aquitaine and one by Drilling and Exploration Co. France's first joint venture has the participation of a Texas independent, D. D. Feldman, who has joined forces with PREPA, a French company to explore permits held by Ste. d'Etudes Petrolieres, of which Mr. Feldman owns 56.72% and Republic Supply Co. of California 8%.

Forest Oil Corp., has ignored current unrest and acquired exploration rights to the entire island of Cyprus, including offshore water and only excepting a square mile in the southwest which is under concession to local private capital.

Germany and Holland are seeing a steady growth of exploratory activity. Of the 106 rigs operating in Germany on August 1, eight were running for Gewerkschaft Brigitta, five for C. Deilmann Bergbau, G.m.b.H., 19 for Deutsche Erdol, 12 for Deutsche Schachtbau and Tiefbohr, six for Deutsche Vacuum, 23 for Gewerkschaft Elwerath, eight for Preussag, 13 for Wintershall, six for Haniel and Lueg and six

**DRILLING RIGS ACTIVE**
**(As of August 1, 1956)**

| Country | Number of Rigs |
|---|---|
| Western Hemisphere | |
| Alaska | 4 |
| Argentina | 48 |
| Bolivia | 4 |
| Brazil | 28 |
| British Honduras | 1 |
| Canada (Western) | 247 |
| Chile | 6 |
| Costa Rica | 1 |
| Cuba | 11 |
| Colombia | 20 |
| Ecuador | 9 |
| Haiti | 1 |
| Jamaica | 1 |
| Mexico | 95 |
| Peru | 20 |
| Trinidad | 27 |
| United States | 2,536 |
| Uruguay | 1 |
| Venezuela | 128 |
| TOTAL W. HEMISPHERE | 3,188 |
| Eastern Hemisphere | |
| Algeria | 15 |
| Angola | 2 |
| Australia | 13 |
| Austria | 15 |
| Bahrain | 3 |
| British Borneo | 9 |
| British Isles | 9 |
| Burma | 4 |
| Egypt | 8 |
| Ethiopia | 1 |
| France | 29 |
| French Equatorial Africa | 9 |
| French Morocco | 8 |
| Germany (West) | 106 |
| Greece | 3 |
| India | 4 |
| Indonesia | 22 |
| Iran | 5 |
| Iraq | 14 |
| Israel | 16 |
| Italian Somaliland | 1 |
| Italy and Sicily | 50 |
| Japan | 15 |
| Kuwait | 5 |
| Madagascar | 1 |
| Netherlands | 9 |
| New Guinea | 4 |
| Nigeria | 1 |
| Pakistan | 7 |
| Portugal | 2 |
| Qatar | 7 |
| Saudi Arabia | 12 |
| Spain | 3 |
| Tunisia | 5 |
| Turkey | 5 |
| Yugoslavia | 26 |
| Zanzibar | 1 |
| TOTAL EASTERN HEMISPHERE | 359 |
| WORLD TOTAL | 3,547 |

for Itag. Nine rigs were running in Holland, two for International Drilling, six for N.V. de Bataafsche Maatschappij and one for Drilling and Exploration Co.

The Molasse Basin, a petroliferous province which extends into Switzerland from Austria, is attracting the attention of several companies new in foreign work. Among the companies holding exploration concessions are Ste. des Hydrocarbures, Ste. d'Etudes d'Interets Miniers, Arbeitschusshuss des Konsortiums fur Erdolforshung in der Schweiz (a consortium formed with the various cantons for exploration) and various independent operators. The Ste. Middleland, owned 75% by Swiss interests and 25% by R. Henquet, European manager for D. D. Feldman of Texas, recently began operations and received a concession in Vaud canton. Other American interests in Switzerland include Molasse Erdol-Forderungs A.G., in which the U. S. drilling company of Heathman-Seeligson of Wichita, Kansas, participates and which has done surface and siesmic work in Switzerland. The latter company recently received a concession in France.

In Italy 371 applications have reportedly been received by the government for exploration concessions, pending the passage of the new oil law. Italian companies such as Montecatini are active, but Heathman-Seeligson also has applied for a permit in company with an Italian company, Snia Viscosa. More independents will be interested in the country when the new law is passed in final form. One of them, Reiter-Foster Oil Corp., is now negotiating a concession.

In Sicily the list of concessionaires in exploration includes about 26 different companies, most of them local Italian concerns. Fifty rigs were reported operating in Italy and Sicily during August. Petrosud, a Gulf affiliate in Italy, had two, Esso Standard two, Gulf Italia two, and Montecatini one. The remainder were mostly working for the government. Cia. Ricerche Sicilia, an affiliate of Western Geophysical Co. International, is drilling on a 202,000-acre concession in southwestern Sicily.

Elsewhere in Europe independent operators are busy in countries such as Greece, where the American-Grecian Oil Co., a Maryland corporation headed by Martin Lerman of St. Louis, is exploring and rehabilitating the old oil field of Zakynthos Zante, one of the Ionian Islands.

Two other independent operators are drilling at present. William Helis, Inc., has two rigs going, while the German firm of Deilmann Bergbau has one running, both figures as of August 1.

A Swedish company, Cia. dos Petroleos de Portugal, has recently joined with Socony Mobil to test Portuguese prospects after about 15 years of search. The syndicate is now drilling its third exploratory well.

In Spain exploration has been carried on by two Spanish companies, CIEPSA and CAMPSA, plus a government company known as ADARO. CAMPSA was joined by the German company, Deilmann Bergbau, and is drilling at present. The largest amount of exploration is being done by Valdebro, a joint company with the government's INI (Instituto Nacional de Industria) and General American Oil Co. of Texas which is owned 10% by California Texas Oil Co., 10% by the Texas consulting firm of DeGolyer and McNaughton, and 5% each by Delta Drilling, Tyler, Texas, Lion Oil Co., El Dorado, Bear Stearns and Co., a New York investment house, 5% and E. E. Fogelson, a Dallas oil man. The remaining participation is unknown. The company participates equally with the government in exploration and has drilled several wells. Its tenure in Spain is now drawing to a close, since operations have been conducted since around 1951 under a five-year contract. Three wells reported drilling at the beginning of August, two for the government (which may include Valdebro's) and one for CIEPSA.

Among the independent companies in the Middle East are the nine participants in the Iranian consortium. These include American Independent Oil Co., Atlantic Refining Co., Hancock Oil Co., Getty Oil Co. (formerly Pacific Western Oil Corp.), Richfield Oil Corp., San Jacinto Petroleum Corp., Signal Oil and Gas Co., the Standard Oil Co., (Ohio), and Tidewater Oil Co. The government of Iran has recently indicated it will receive bids for exploration in Iraq outside the Consortium area. These would be through NIOC (National Iranian Oil Co.), which has a monopoly over the entire country.

The Kuwait-Saudi Arabia Neutral Zone has two firmly established independents. Getty Oil Co. is operating with American Independent Oil Co. (Aminoil), which is owned by Phillips Petroleum, Lario Oil and Gas Co., Globe Oil and Refining Co., Sunray Oil Corp., Deep Rock Oil Corp., J. S. Abercrombie, Ralph K. Davies, Ashland Oil and Refining Co., Signal Oil and Gas Co., and Hancock Oil and Gas Co.

In Turkey there are several independents represented among the companies who have newly received licenses for exploration. They include, in addition to the major companies represented, Tidewater Oil Co., D. D. Feldman, Gilliland Oil Corp., Bolsa Chica Oil Co., Husky Oil Corp. from Cody, and the German firm of C. Deilmann Montan G.m.b.H. The Istanbul Natural Gas Co. is also exploring. It is owned 70% by the Ralph M. Parsons Co., 20% by local Turkish capital and 10% by Turkyie Petrolleri A.G. or Turkish National Oil Co., owned 51% by the government.

Five rigs were running in early August, all government rigs although unconfirmed reports stated the Istanbul Natural Gas Company also had one rig working.

Israel is experiencing a wave of exploratory activity by independents which has been stimulated by the recent discovery of oil by Lapidoth-Israel Petroleum Co. Many of the major companies are excluded from exploration in Israel by the Arab boycott which is extended to companies which have trade relations with Israel. Since many of the major companies have

*Indonesian workmen cutting a passage through dense jungle in Central Sumatra, (Photo courtesy of Standard-Vacuum Oil Co.)*

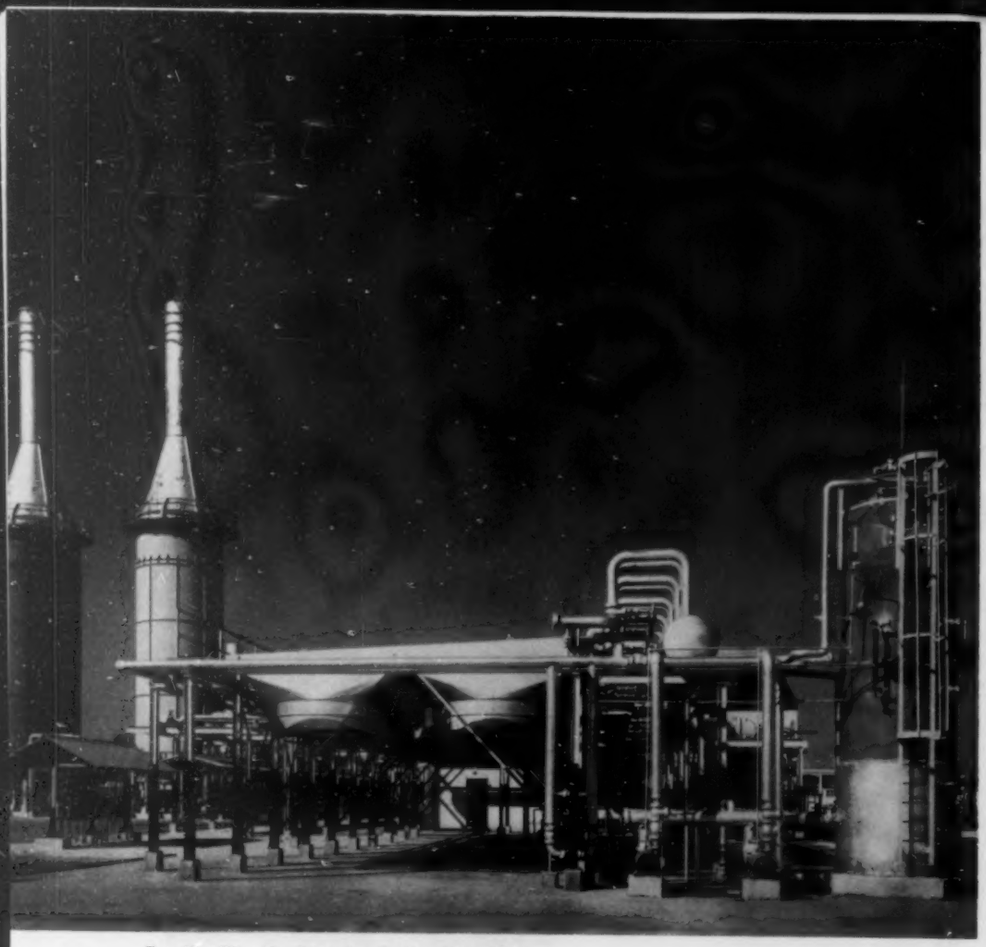
Middle East interests outside Israel which far outweigh any potential discovery in the country, they have not joined the exploration rush.

The independents now in Israel include: a Texas independent, D. C. Bintliff; Israel-American Oil Corp., Inc., owned by the New York investment firm Bear, Stearns & Co., and the Husky Oil Co. of Wyoming; the Israel Continental Oil Co., Ltd., owned by Canadian interests; Central Explorers, Ltd., a Canadian firm; Canadian Pontiac Petroleum Co., which holds a farmout area from Israel Continental; "DELEK", of which Hisdradut (Israel Labor Confederation) holds 35% of the stock; Israel Mediterranean Oil Co., owned by William F. Buckley and the Pantepec Oil Co.; and the latter's subsidiary, the Tri-Continental Drilling Co.

Israel Oil Prospectors Corp., Ltd., a Haifa firm, is owned by private Israel, American and Swiss interests and connected with the Israeli Trade Unions' Solel Boneh, and a group of American prospectors headed by Max Orowitz and Sam Friedland. Kerr McGee Oil Industries of Oklahoma and an Israel drilling concern, the Madzada Co., are drilling for them. Lapidoth-Israel Petroleum Co., Ltd., is owned by Mekoroth Water Works, Ltd. of Tel Aviv, which has the majority holding in the company, and by the American-Palestine Trade Corp. ("AMPAL"), headed by Abraham Dickenstein of New York (which holds Lapidoth's stock through the American-Israel Petroleum Corp. of New York). An interest is held by an independent U. S. refiner, L. Sonneborn Sons, Inc.

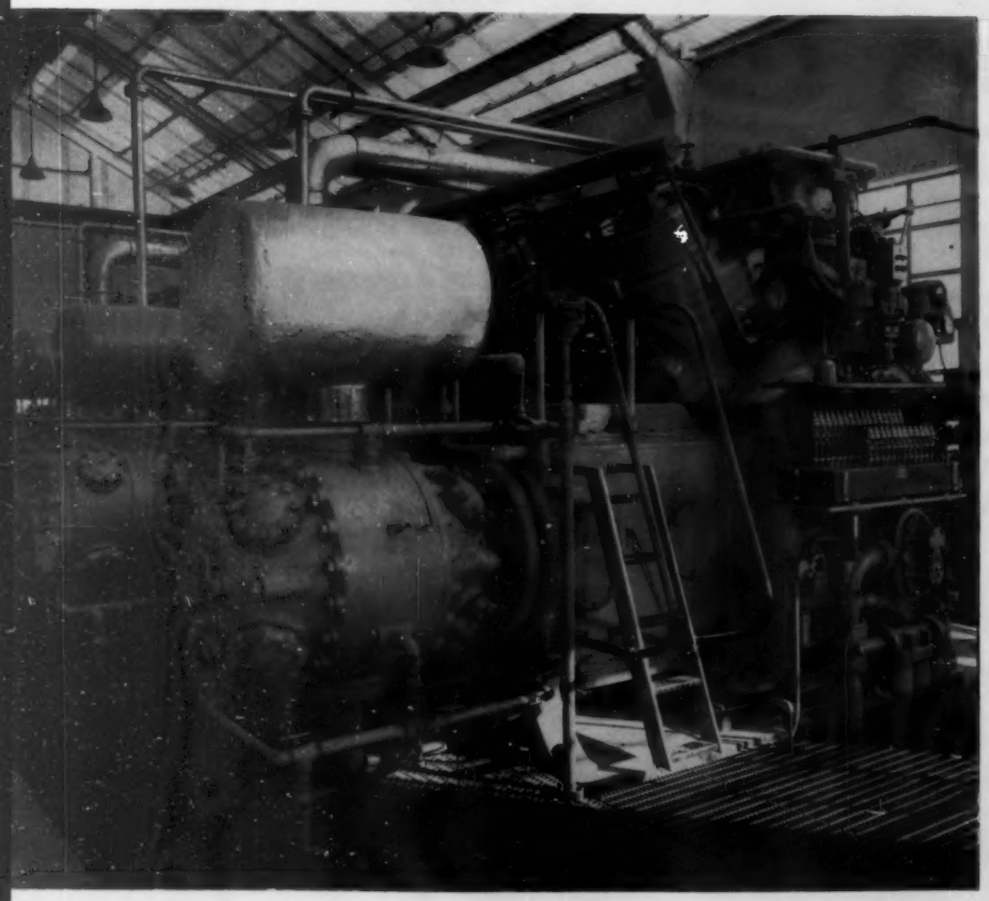
Nadel & Gusman, independents from Oklahoma connected with the Palestine Economic Corp. of New York are also exploring. Pan Israel Oil Co., Inc., an American

*(Continued on page 116)*



*Two 52 million Btu Petrochem-Isoflow Rich Oil heaters.*

*Two 880 hp Cooper-Bessemer compressors.*



*By selling natural gas for export and reducing foreign purchases, Petroleos Mexicanos'*

# REYNOSA

THE new Reynosa natural gasoline plant built by Petroleos Mexicanos just south of the United States border in the state of Tamaulipas at a cost of $8 million is improving the economy of Mexico by nearly $20 million per year. The $8 million cost included gathering systems, utilities and other auxiliary installations.

Benefits which have accrued to the nation are: (1) importation of 30 mmcf of gas per day at a cost of $1,800 per day is eliminated, (2) production of gasoline is increased by 4,500 b/d, eliminating importation of this same volume at a daily cost of $18,450, (3) sale of 200 mmcf/d of gas at a minimum of $0.142 per mcf results in a realization of $28,000 per day or $10 million yearly, and (4) importation of LPGas is reduced by 2,744 b/d, or a saving of $4,610 daily.

The Reynosa absorption plant was built by Petroleos Mexicanos personnel. Hudson Engineering Corp., Houston, designed and engineered the plant and procured the equipment. The plant has a design gas handling capacity of 300 mmcf/d.

Some 200 mmcf daily of the residue gas from the plant will be exported, under a recently concluded contract, going into the Texas Eastern Transmission system. The balance of the gas goes to Monterrey and other points to satisfy the demand within Mexico.

Liquids extracted by absorption, together with condensate fractions, are blended with fractions from the existing 10,000 b/d Reynosa refinery to make regular and premium grades of gasoline, kerosine and various specifications of fuel oils.

The new field processing plant extracts hydrocarbons in four large absorbers. A reabsorber-propanizer, still, and fractionation train (consisting of deethanizer, depropanizer, and debutanizer) complete the hydrocarbon extraction-separation process facilities.

The still is provided with a naphtha stripper. This operates, as required, on a still sidestream for the removal of an intermediate cut. In effect, this naphtha stripper makes possible production of two hydrocarbon fractions from the still: (1) the usual overhead stream which goes on to the fractionation train, and (2) the sidecut stream which may be blended into regular gasoline ("Mexolina").

# Gasoline Plant Aids Mexican Economy

As noted the residue gas is distributed in part to fulfill the demands internally in Mexico. The remainder is exported. This necessitates the design of two systems of gas gathering for these two services. One system is for gathering of the high pressure gas which will go for export, and the other of relatively low pressure gas for use within Mexico. The high pressure gas gathering is at a working pressure of 1,100 psi and that for the low pressure gas at 650 psi.

For those wells which produce crude oil with gas, separator batteries are employed. The crude oil is received in storage tanks for later pumping to the Reynosa refinery, and the gas stream which is separated is injected into the lines in the gas gathering system.

The gas streams of the high and low pressure systems are received in the absorption plant in inlet gas scrubbers in which distillates are separated as well as small quantities of crude oil entrained in the gas. The wet gas passes through absorbers in which the major part of the propane, the butanes, the natural gasoline and the heavier hydrocarbons are extracted. Lean gas goes through dehydrators. The liquids removed in the inlet scrubbers go to a flash tank where lighter hydrocarbons are liberated and passed to the reabsorber section from which the more heavy hydrocarbons go to the condensate fractionator. In this latter vessel these hydrocarbons are separated into gasoline, naphtha, kerosine, gas oil, and residual.

Average composition of gas employed in design is as follows:

| *Component* | *Volume %* |
|---|---|
| $CO_2$ | 0.02 |
| $N_2$ | 0.16 |
| $C_1$ | 93.29 |
| $C_2$ | 3.31 |
| $C_3$ | 1.07 |
| i-$C_4$ | 0.36 |
| n-$C_4$ | 0.34 |
| i-$C_5$ | 0.18 |
| n-$C_5$ | 0.16 |
| $C_6$ | 0.32 |
| $C_7$-plus | 0.79 |
| | 100.00 |

Heptanes-plus content is 21.87 gallons per mol. Stock tank condensate specifications call for an API gravity of 45 to 60 with an ASTM typical distillation as follows:

| | |
|---|---|
| I.B.P. | 90-120°F. |
| 10 | 160-190 |
| 20 | 210-240 |
| 80 | 390-440 |
| 90 | 450-500 |
| E.P. | 500-550 |

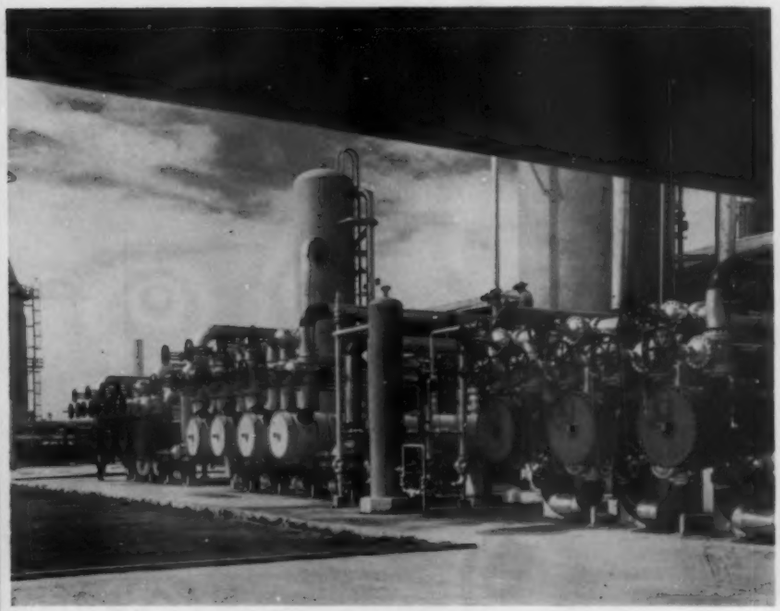
Absorption oil is made from condensate of the boiling range given above. It is a 184 M.W. oil with boiling range of 400 to 500°F. and API gravity of 46.1.

Design calls for daily production as follows:

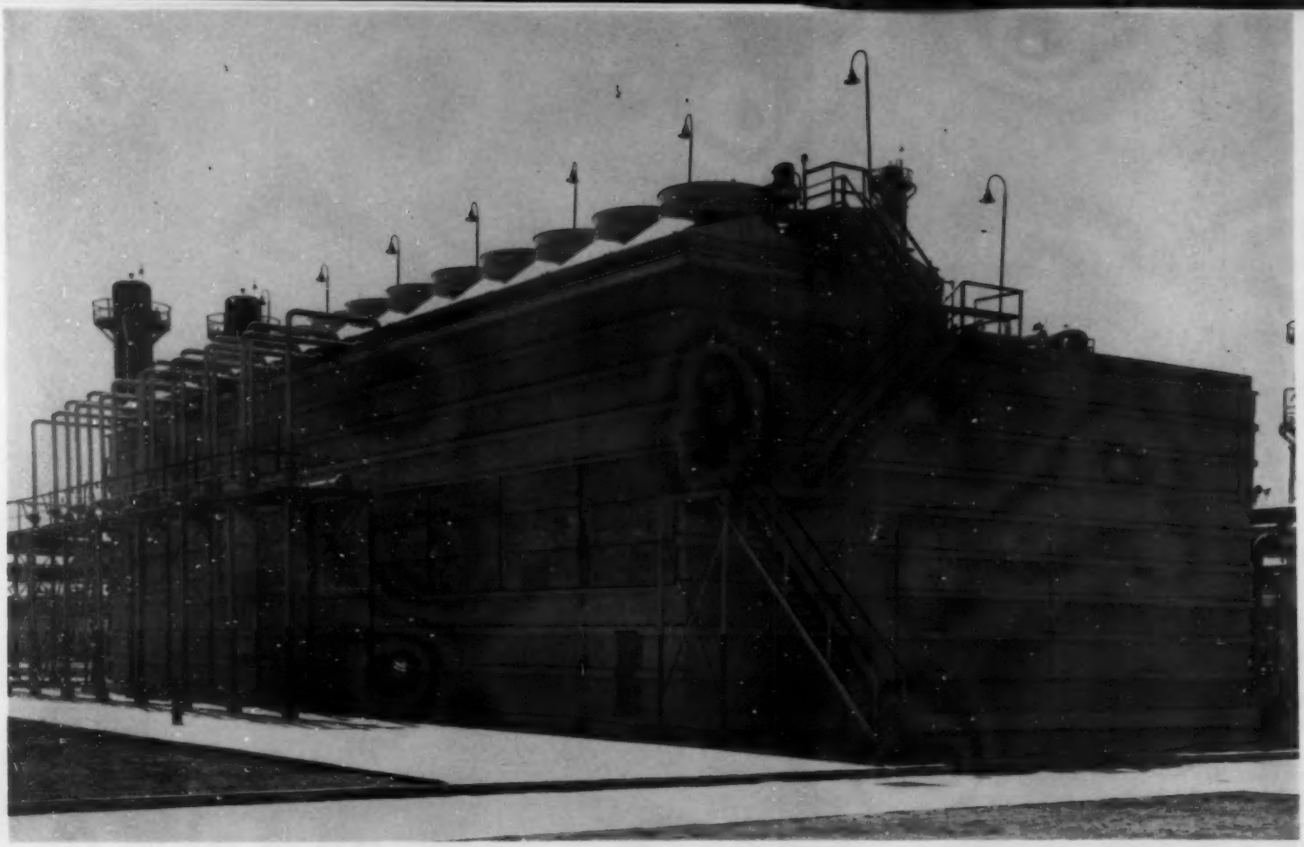
| | *Products* | *Gallons per day* |
|---|---|---|
| | Propane | 47,716 |
| | Butanes | 67,544 |
| Gasoline, | 350°E.P. 6# Rvp | 188,864 |
| | Residuum | 35,332 |
| | | 339,456 |

Inlet scrubbers remove hydrocarbon condensate and water which has been entrained. The water goes to a disposal sys-

*Heat exchange area.*



*Solo-Aire cooling units dissipating heat direct from finned tubes of fan-blown air.*



*Combin-Aire—Hudson cooling system dissipating approximately 100 million Btu/hr with average water evaporation of less than 100 gpm.*

tem. The hydrocarbon condensate is reduced in pressure through a flash tank and goes to the condensate stripper where propane and lighter are removed and together with some butanes and heavier flow overhead to a condenser. Condenser liquid supplements still reflux. Uncondensed vapors overhead from the flash tank flow to the reabsorber. The stripped condensate goes to the condensate fractionator.

Gas from inlet scrubbers goes through four large absorbers. The rich oil from the absorbers is reduced in two stages through flash tanks. Flash vapors plus those from the condensate flash tank go to the recompressor which returns them to the absorbers. A portion of the rich oil from the lower pressure flash flows through heat exchangers countercurrent to the partially cooled stripped lean oil and enters the rich oil propanizer. The remainder of the cold rich oil enters the propanizer several trays above the hot rich oil from the exchangers, cooling the hot vapors from the feed tray before they enter the reabsorber.

The propanizer-reabsorber functions like a fractionator. The reabsorber forms the top section and acts as a fractionating section. Instead of reflux it utilizes absorption oil. Vapors from the lower propanizer section, plus uncondensed vapors from the condensate stripper overhead condenser, and uncondensed vapors from the deethanizer enter the reabsorber and flow countercurrent to absorption oil. Propane and heavier are absorbed from these streams. Lighter components overhead from the absorber go to the plant fuel system.

Piping is arranged so that the deethanizer residue gas can be returned to the absorbers if necessary. The propanizer is the stripping section of the column and the oil to oil exchangers and hot rich oil flash tank act as the reboiler. Flash tank vapors enter the propanizer and flow countercurrent to the rich oil which strips out the methane and a portion of the ethane. The heavier components in the stripping vapors are absorbed and displace the methane and ethane in the rich oil.

The degree of demethanization and deethanization is controlled by the pressure established for the reabsorber-propanizer-still system by means of the pressure con-

*Water treating and storage tanks.*

troller in the reabsorber residue gas line.

In the distillation section rich oil from the hot rich oil flash tank goes through heat exchange and direct fired heaters to the still. A portion of the rich oil bypasses the heating equipment and is used as still reflux. The optimum quantity of rich oil reflux is determined by calculation and the remaining reflux requirements of the column are furnished by condensed overhead vapors in the usual manner.

Facilities are provided for continuous reclaiming of absorption oil and for manufacture of absorption oil from the stabilized condensate. The absorption oil reclaiming facilities are designed for a feed rate which permits rerunning of the entire volume of lean absorption oil in the system in seven days and to produce several times the required absorption oil makeup.

An intermediate cut might be required if the plant produced gasoline of a lower end point than the initial boiling point of the absorption oil. Therefore, a side stream stripper column is connected to the still. This may be used to deliver a naphtha material of about 325-400°F. boiling range.

In the condensate from the still overhead vapors are received in the raw product accumulator and from there pumped to the deethanizer. To reduce the propane content in the uncondensed overhead vapors from the deethanizer, refrigerated condensers are provided for this column. Thus, residual vapors will be approximately 95% ethane, 5% propane and traces of methane, meeting requirements of commercial ethane product purchasers.

Propane and heavier hydrocarbons are produced as bottoms from the deethanizer and flow in the usual manner through the depropanizer and debutanizer. Propane is produced overhead from the depropanizer and flows through dryers to storage. Butanes are produced overhead from the debutanizer and flow to storage. Debutanizer bottoms go to gasoline storage.

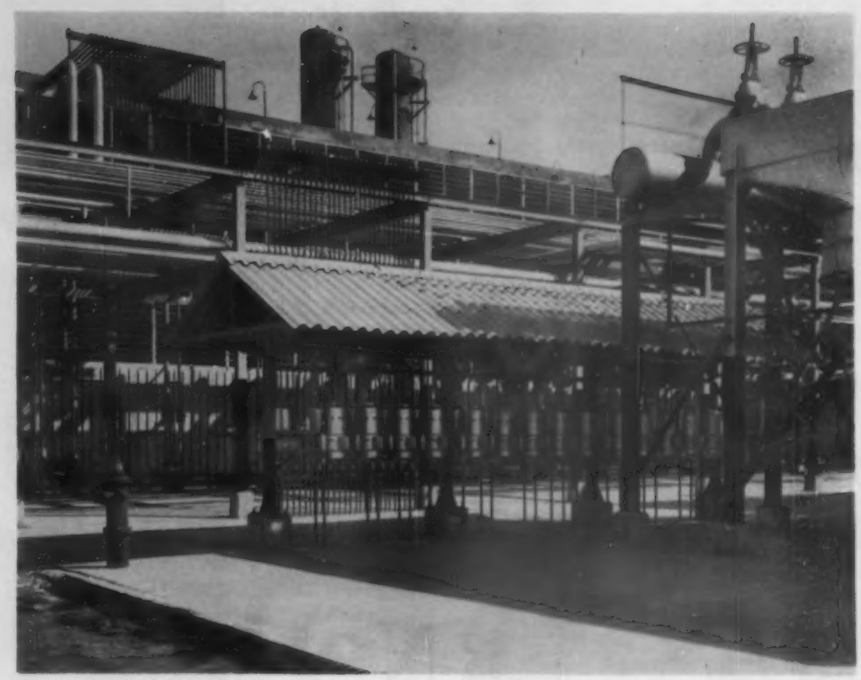
Bottoms from the condensate stripper flow to the condensate fractionator where a controlled end point gasoline is taken overhead and kerosine and heavier materials are produced. Gasoline vapor pressure is controlled in the debutanizer by the quantity of butanes left in the bottom product. Gasoline end point is controlled in the still and in the condensate fractionator by proper control of pressure and temperature at the top of these columns.

At present the plant operates with 50% propane recovery. It is anticipated that in the future this may be increased to 75% recovery.

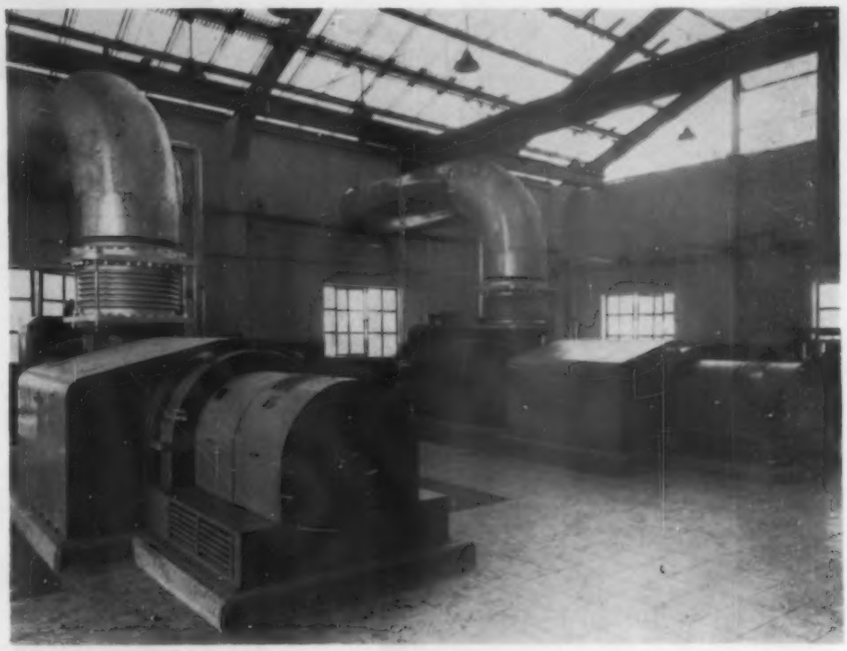
The heart of the cooling system consists of a Hudson "Combin-Aire" unit in which a water cooling tower is combined in one structure with air cooled units. In summer hot air is first cooled through being drawn through the cooled water and then used in the air cooled units. In winter very little water is required, the cool air being used directly in the air cooled units.

The "Combin-Aire" dissipates approximately 100 million Btu/hr with an annual average water evaporation rate of less than 100 gpm, an important item in a water-scarce area. Hudson "Solo-aire" coolers dissipate an additional 165 million Btu/hr direct to air, using electric motor driven fans to move air across the finned tubes.

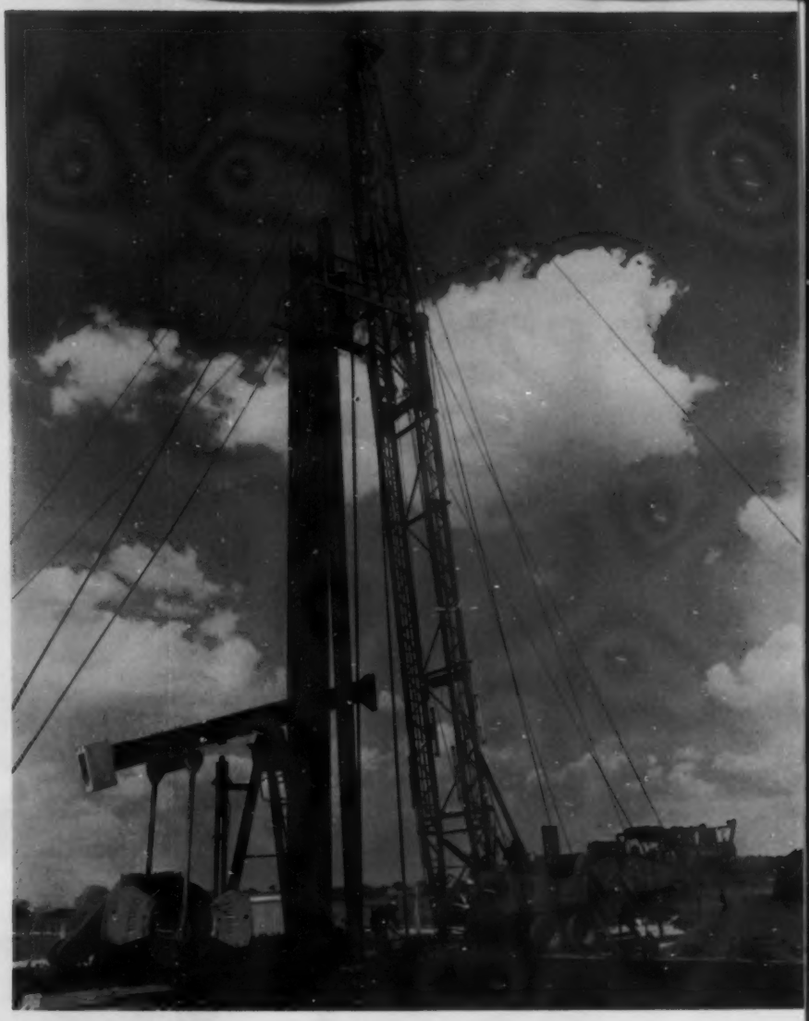
The Reynosa refinery facilities include an atmospheric crude distillation section with crude throughput capacity of 10,000 bbls. per day, producing straight-run gasoline, kerosine, gas oil and residuum. This residuum is at present very paraffinic and is taken through thermal cracking in a Dubbs plant making higher octane cracked gasoline which goes into the premium finished gasoline ("Super Mexolina"). The residuum from thermal cracking is blended with the residuum from the condensate fractionator of the absorption plant and a small portion of the gas oil to make fuel oil of the specifications required. END



*Starter rack for various electric motors (Combine-Aire has 28 motor and fan assemblies).*



*Two 3,000 kw Westinghouse turbo generators.*



*Workover rig in West German field. All photographs with this article courtesy of Gewerkschaft Brigitta. (Shell and Standard of New Jersey)*

*Intensive wildcatting has tested a large proportion of favorable areas so*

# WESTERN GERMANY seeks new exploration prospects

*Drilling crew of Gewerkschaft Brigitta.*

**By Alfred M. Stahmer**

SINCE our last report on oil exploration activities in West Germany, published September 1955 in WORLD PETROLEUM, a number of new oil and gas discoveries were made in several parts of the country. Some are of minor importance, but finds like those of Lueben, Leiferde and Eilte-West in Hannover, Elsfleth in the Weser-Ems district and Landau in Southern Germany contributed materially to German underground oil reserves, estimated at 349 million barrels, about 49 million tons, of proven and additionally (about 114 million barrels) of probable reserves as of Jan. 1, 1956.

German crude oil production continues increasing from month to month. In 1955 output amounted to 61,469 b/d, i.e. nearly 0.5 million ton or 18% more than in 1954. In the last five years production has nearly trebled. The first six months of 1956 resulted in an output of 66,096 b/d which was more than anticipated by the forecast of the Wirtschaftsverband Erdoelgewinnung (Association of Crude Producers). That association estimated a total of 24.1 million barrels for 1956, i.e. only about 1.6 million barrels more than was recovered in the previous year. Considering, however, that

daily production climbed 69,475 b/d in June, it may be expected that at least 68,370 b/d will be produced in 1956.

Nevertheless, it does not seem justified to be too optimistic in respect to future development of the German crude oil production. And it was doubtless for good reasons that the Wirtschaftsverband Erdoelgewinnung in its estimates of output during the next five years was rather conservative, anticipating only a small increase rate which, according to its calculations, will perhaps lead to a yield of about 73,250 b/d in 1960.

As a matter of fact, for some of the companies participating in the search for oil it is already difficult to find promising exploration objectives on their concession areas in the hitherto known strata because so many prospects have been tested in the course of the very intensive drilling campaign since the beginning of the thirties. Nevertheless, current wildcatting still leads to new finds if economic importance. An example for this is the recent discovery at Elsfleth near the lower Weser river where hitherto unknown oil-bearing Jurassic trench was explored with success. Similar oil accumulations may be found at other places in the future.

In many areas, especially in Northwestern Germany, the limits of a promising search for oil are already outlined. Exploration in the Bavarian Molasse basin has not justified the optimistic expectations which were held when the first finds were made east of Munich at Ampfing and Isen. Also in the Upper Rhine Valley Graben wildcatting is not showing very encouraging results. Chances for finding oil here are mostly limited to small heavily faulted block structures.

Oil companies now are considering the chances which might be offered in Northwest Germany by the older sediments of Permean, Carboniferous and Devonian age, which at depths of more than 13,000 feet lay below the huge Zechstein salt deposits. Thus far this Pre-Salinarian has not yet been reached by any well, mainly because drilling in the very thick salt formation offers special difficulties. To attack it, means not only very high costs but also the solution of various technical problems. Among the 132 rotary drilling rigs which are operating in the Federal Republic, only few are able to reach more than 12,000 or 13,000 feet. To pass the salt a suitable drilling mud must be applied. A supposition for locating Pre-Salinarian wildcats is geophysical research using modern equipment to test the depths below the salt. The hitherto deepest hole in Germany was drilled by Gewerkschaft Brigitta (Shell and Standard Jersey affiliate) in its Steimbke-Rodewald field, reaching 12,600 feet. Brigitta is now sinking another deep well in the Zechstein salt formation near Cismar (Baltic Sea coast) which is to test definitely gas shows in the Zechstein encountered in a previous well. Heretofore, drilling in Germany has been limited normally to depths of about 6,000 to 8,000 feet.

While the future chances of the Pre-Salinarian are rather uncertain, some new discoveries and extensions in the past 12 months can definitely be booked on the credit side. An example is seen in the northern-most oil province of Holstein-Hamburg. At the western edge of the deep Jurassic trough on the borders of which the fields Ploen, Boostedt and Bramstedt in the south and Kiel in the northeast have been developed a recent test was Schwedeneck 6b directed by the joint interest Wintershall-Deutsche Erdoel-AG. The well was located about 11 miles east of Eckernfoerde town, this May, encountered good oil traces in a sandstone of the Dogger beta formation at a depth of about 5,300 feet. After a short flow, the hole went to water. Testing is now in progress in a further wildcat drilled at a structurally higher location. It is to be hoped that here near the Baltic Sea coast a new oil field of the Holstein province can be developed in the future.

In Southern Holstein a new pay in the Dogger delta was found in the Bramstedt field of the DEA-Mobil Oil-Preussag Consortium with the extension well Bramstedt 13. The well recorded an initial daily yield of about 228 b/d of crude oil through a ⅛-inch choke, the specific gravity being 0.870. In June 1956 the Bramstedt field delivered 1,460 b/d of crude oil.

In the old oil province of Hanover which delivers about one-third of the German crude oil output drilling efforts still are concentrated on the Jurassic trough of Gifhorn, the edges of which are systematically tested for further oil accumulations.

The Hankensbuettel field discovered in 1954 is now topranking among the Hanoverian oil fields with a monthly output of about 135,547 b/d.

About seven miles northeast of Hankensbuettel, only one mile off the border of the Soviet Zone, the successful wildcat Lueben 1 opened a new field in the beginning of November 1955. The concession in the Lueben district is a joint interest of Preussag-Gewerkschaft Elwerath-Mobil Oil-Itag. The oil was found in a sandstone of the Dogger beta at a depth of about 4,200 feet, the initial daily yield being about 120 barrels of crude flowing through a 1/12-inch choke. As in so many other new fields the Lueben structure was detected by reflection seismic investigations. Further wells were sunk in the meantime, and in June 1956 Lueben delivered 278 b/d of crude oil with a specific gravity of 0.850.

In the western part of the Hanoverian district Gewerkschaft Brigitta was successful in February of this year in discovering a new oil deposit two miles northwest of the oil field Eilte with its exploratory well Eilte B5 in the Dogger formation, the depth being about 5,600 feet. This find which was named Eilte-West, is neither stratigraphically nor with regard to its tectonic structure connected with the old field Eilte at the eastern flank of the Eilte-saltdome. The discovery well had been drilled through an overhang of the saltdome. The initial yield was about 189 barrels of crude per day through a ¼-inch choke.

A promising find was made early in June 1956 by Deutsche Erdoel-AG. about five miles southwest of Gifhorn town. The wildcat Leiferde 1 of DEA could be put into production at a depth of 2,700 to 2,736 feet flowing approximately 350 barrels of crude per day through a 1/6-inch choke at a tubing pressure of 26 atm. from a sandstone of the deeper Valendis and the Wealden respectively, the specific gravity of the crude being 0.856. Further north of the location DEA had already carried out ex-

*Intensive geophysical studies are being made in untested areas in West Germany.*

ploration work years ago. The Leiferde structure found by seismic service, is limited in the east by a system of faults which connect the saltdomes of Gifhorn with that of Rolfsbuettel-Hillerse.

The outstanding find of Elsfleth on the left side of the lower Weser river, made by Gewerkschaft Elwerath early in April 1956 has been mentioned previously. In this northern part of the Weser-Ems district up to now only one small field was known, namely Etzel, southwest of Wilhelmshaven town. The geological conditions of Etzel, however, are quite different from those of Elsfleth, where on the basis of reflection seismic investigations a hitherto unknown Jurassic trough was explored. The first successful well, Elsfleth 2a, encountered oil at a depth of about 5,000 feet in a sandstone of the Dogger formation below the Alb basis. The well is pumping about 63 to 76 b/d.

In July another well, Elsfleth 3, which was located 900 feet northeast of the discovery well, encountered a second pay in the Dogger gamma sandstone. This hole flowed 95 barrels of crude oil daily through a 1/8-inch choke (specific gravity 0.908).

Two finds of apparently minor importance are reported in the southern part of the Weser-Ems district, namely Vestrup and Dickel. The exploratory well Vestrup 1 of the joint interest Gewerkschaft Brigitta-Mobil Oil, located about seven miles south of the town Cloppenburg, struck oil at a depth of about 6,000 feet on the southern flank of a structural uplift which was also detected by means of reflection seismics, the oil-bearing horizon is in the Kimmeridge.

Dickel is one of the prospects in which much drilling was done and little oil was found. In 1953 the wildcat Rehden 7 of Wintershall AG., which later on was renamed Dickel 1, encountered oil and some natural gas. The hole was shut in to await further exploration results. In August 1955 the exploratory well Dickel 10 was successful and recently a further well, Dickel 11, struck oil, too, in a sand of the Wealden formation. In the course of the pumping tests each of these wells produced 31 to 63 barrels of crude daily from a depth of about 3,000 feet. Regular production has not yet been started.

The fact that even the small Emsland district, the oil-bearing anticlines which were systematically explored in the past 12 years, still offer chances for new finds, was proved by the exploratory well Hebelermeer 3 of the joint interest Mobil Oil-Gewerkschaft Elwerath-Deutsche Schachtbau. This wildcat found some light oil in a tectonic trap structure situated at the northern flank of the syncline of Fullen at a depth of nearly 4,000 feet. In December 1955 Hebelermeer 4 encountered the same pay, i.e. the Benthein sandstone, gas-bearing on another block of the structure. The well was shut in and

## GERMAN CRUDE PRODUCTION

| | June 1956 | | 1st Half 1956 | |
|---|---|---|---|---|
| | Barrels Daily | Metric[1] Tons | Barrels Daily | Metric[1] Tons |
| **Holstein-Hamburg** | | | | |
| Heide | 1,577 | 6,630 | 1,584 | 40,430 |
| Kiel | 207 | 871 | 154 | 3,943 |
| Ploen | 1,252 | 5,262 | 1,224 | 31,247 |
| Boostedt | 2,391 | 10,047 | 2,443 | 62,361 |
| Bramstedt | 1,462 | 6,145 | 1,281 | 32,693 |
| Reitbrook | 1,106 | 4,646 | 1,127 | 28,777 |
| | 7,997 | 33,601 | 7,814 | 199,451 |
| **Emsland** | | | | |
| Hebelermeer | 20 | 83 | 33 | 859 |
| Emlichheim | 2,975 | 12,500 | 2,878 | 73,460 |
| Ruehlertwist | 2,765 | 11,620 | 2,714 | 69,275 |
| Ruehlermoor | 8,169 | 34,322 | 7,213 | 184,120 |
| Scheerhorn | 2,320 | 9,750 | 2,265 | 57,827 |
| Adorf | 5 | 21 | 1 | 21 |
| Lingen | 2,399 | 10,083 | 2,338 | 59,673 |
| Georgsdorf | 5,373 | 22,578 | 5,017 | 128,071 |
| | 24,028 | 100,957 | 22,460 | 573,306 |
| **Weser-Ems** | | | | |
| Etzel | 37 | 154 | 46 | 1,181 |
| Elsfleth | 66 | 276 | 16 | 413 |
| Molbergen | 247 | 1,038 | 224 | 5,730 |
| Ostenwalde | 313 | 1,316 | 278 | 7,103 |
| Liener | 168 | 708 | 153 | 3,915 |
| Garen | 30 | 126 | 30 | 765 |
| Hemmelte-West | 2,744 | 11,547 | 2,631 | 67,173 |
| Vestrup | 50 | 210 | 44 | 1,128 |
| Quakenbrueck | 50 | 210 | 55 | 1,413 |
| Backstedt | 541 | 2,278 | 323 | 8,236 |
| Aldorf | 2,003 | 8,427 | 1,988 | 50,737 |
| Dueste-Wietingsmoor | 2,496 | 10,501 | 1,998 | 51,008 |
| Dickel | 9 | 40 | 2 | 49 |
| Barenburg | 1,636 | 6,885 | 1,537 | 39,245 |
| Siedenburg | — | — | 1 | 37 |
| Visgtei | 1,489 | 6,264 | 2,430 | 36,504 |
| | 11,878 | 49,980 | 10,759 | 274,637 |
| **Hanover** | | | | |
| Meckelfeld | 40 | 168 | 41 | 1,044 |
| Steimbke | 1,037 | 4,365 | 1,045 | 26,679 |
| Suderbruch | 2,881 | 12,122 | 2,870 | 73,268 |
| Eilte-West | 63 | 265 | 41 | 1,058 |
| Eilte | 3 | 12 | 2 | 42 |
| Hademstorf | 96 | 403 | 96 | 2,457 |
| Thoeren | 288 | 1,212 | 293 | 7,476 |
| Wietze | 506 | 2,130 | 496 | 12,666 |
| Fuhrberg-Hambuehren | 705 | 2,965 | 706 | 18,020 |
| Nienhagen-Haenigsen | 1,826 | 7,684 | 1,802 | 46,002 |
| Wathlingen | 162 | 684 | 163 | 4,162 |
| Eicklingen-Wienhausen | 216 | 909 | 217 | 5,546 |
| Hohne | 3,549 | 14,934 | 3,423 | 87,384 |
| Eldingen | 1,917 | 8,067 | 1,891 | 48,284 |
| Lueben | 276 | 1,170 | 276 | 7,046 |
| Hankensbuettel | 4,446 | 18,708 | 4,230 | 107,975 |
| Oerrel-Sued | 387 | 1,630 | 358 | 9,141 |
| Wesendorf-Nord | 153 | 644 | 134 | 3,434 |
| Wesendorf | 1,210 | 5,090 | 1,291 | 32,968 |
| Vorhop | 692 | 2,871 | 655 | 16,721 |
| Leiferde | 25 | 106 | 4 | 106 |
| Gifhorn | 26 | 110 | 26 | 669 |
| Calberlah | 10 | 44 | 8 | 216 |
| Stemmerberg | — | — | 1 | 31 |
| Kronsberg-Pattensen | 477 | 2,007 | 445 | 11,349 |
| Hoever | — | — | 2 | 53 |
| Lehrte | 380 | 1,601 | 370 | 9,454 |
| Eddesse-Oelheim | 874 | 3,679 | 868 | 22,153 |
| Meerdorf | 1 | 4 | 2 | 48 |
| Ruehme | 590 | 2,481 | 566 | 14,451 |
| Moelme | 34 | 144 | 33 | 843 |
| Oberg | 131 | 553 | 138 | 3,546 |
| Vechelde | 3 | 11 | 11 | 289 |
| Rautheim | 5 | 24 | 5 | 141 |
| Hohenassel | 377 | 1,588 | 370 | 9,442 |
| Broistedt | 65 | 274 | 60 | 1,524 |
| | 22,497 | 94,659 | 22,549 | 585,688 |
| **Upper Rhine Valley** | | | | |
| Stockstadt | 1,312 | 5,520 | 1,304 | 33,282 |
| Wattenheim | 14 | 61 | 15 | 386 |
| Dudenhofen | 14 | 59 | 7 | 171 |
| Landau | 292 | 1,231 | 262 | 6,697 |
| Rot | 122 | 513 | 126 | 3,229 |
| Forst-Weiher | 37 | 154 | 33 | 856 |
| Weingarten | 63 | 265 | 80 | 2,048 |
| | 1,854 | 7,803 | 1,828 | 46,669 |
| **Bavaria** | | | | |
| Heimertingen | 86 | 360 | 61 | 1,551 |
| Ampfing | 227 | 957 | 230 | 5,871 |
| | 312 | 1,317 | 291 | 7,422 |
| | 69,472 | 292,317 | 66,077 | 1,687,173 |

[1]Barrels daily figures converted from metric tons at 7.13 barrels per ton. Totals vary slightly due to rounding.

## ANNUAL PRODUCTION AND DRILLING FOOTAGES OF THE VARIOUS COMPANIES IN 1955

| | Production tons | Barrels | Footage drilled |
|---|---|---|---|
| Gewerkschaft Elwerath | 734,557 | 5,237,391 | 558,239 |
| Deutsche Erdoel-AG. | 586,642 | 4,182,757 | 484,971 |
| Wintershall AG. | 497,575 | 3,499,101 | 439,195 |
| Mobil Oil AG. | 360,441 | 2,569,944 | 238,985 |
| Preussische Bergwerks-und Huetten-AG. | 336,475 | 2,399,067 | 242,082 |
| Gewerkschaft Brigitta | 239,850 | 1,710,131 | 171,964 |
| Deutsche Schachtbau-u.Tiefbohrges.mbH. | 231,901 | 1,653,454 | 133,182 |
| C. Deilmann Bergbau GmbH. | 132,448 | 944,354 | 108,362 |
| Internationale Tiefbohr KG. (Itag) | 14,404 | 102,701 | 18,000 |
| Braunschweigische Bohrges.mbH. | 7,831 | 55,835 | 5,610 |
| Others | 5,110 | 36,434 | 8,550 |
| | 3,147,234 | 22,391,169 | 2,409,140 |

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**1940** Surface Controlled Directional Survey
**1941** The S. P. Dipmeter
**1946** The Magnetic Casing Collar Locater
**1947** The Induction Log
**1947** The Resistivity Dipmeter
**1949** The MicroLog
**1950** The Laterolog
**1951** The Microlaterolog
**1951** The Expendable Perforator
**1952** The Continuous Resistivity Dipmeter
**1953** The Hard Formation Sample Taker
**1954** The MicroLog-Caliper
**1955** The Formation Tester
**1955** The Fluid Sample Taker
**1955** The Long Interval Velocity Survey
**1956** The Combination Induction Electrical Log

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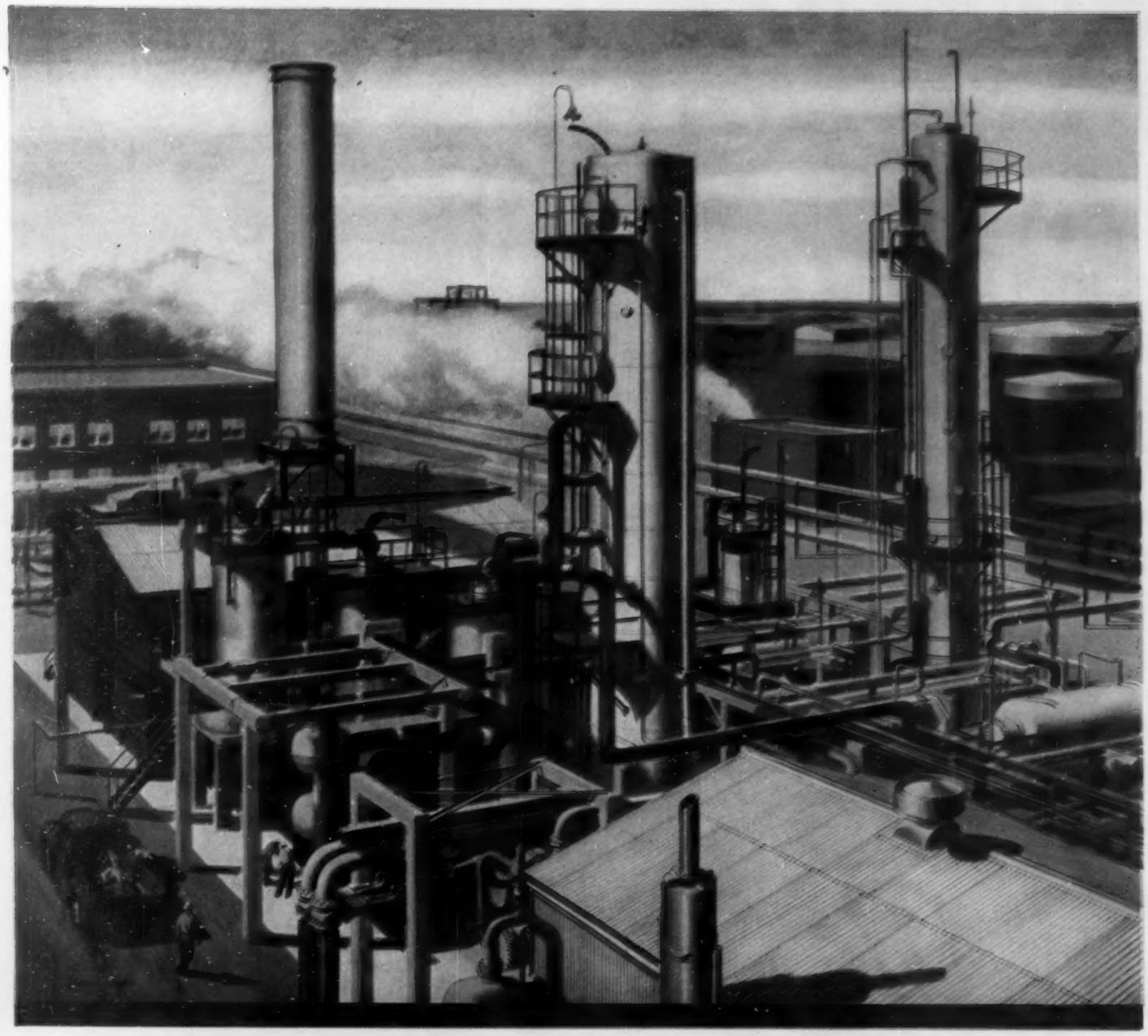

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thus far only small production has been taken from the firt well.

Near the Dutch border, three miles south of the Emlichheim field, Wintershall AG sunk the deep wildcat Emlichheim Z1 to test the Zechstein formation for natural gas. This March the well came in with a satisfactory gas flow from the main Dolomite of the Zechstein at a depth of about 9,200 feet. In June the well delivered approximately 0.5 million cu.m. of natural gas during production tests.

In Southern Germany Landau may be called the outstanding find of the last year. Early in October the joint interest Mobil Oil-Wintershall-Itag struck a prolific oil deposit near the town Landau on the left side of the Upper Rhine, not far from the French border. The well Landau-West 2 successfully tested two horizons of the Pechelbronn layers at a depth of 4,820 to 4,830 feet and 5,075 to 5,090 feet, respectively. From the upper horizon a flow of about 220 barrels daily through a 1/6-inch choke could be achieved during production tests. The lower pay delivered about 190 to 220 barrels daily through a choke of the same diameter. The crude oil has a specific gravity of 0.850.

In the beginning of this year a second well came in at Landau which found some oil in the lower Meletta beds, too, at a depth of 4,260 to 4,300 feet. Structurally the field is situated at a fault zone at the western edge of the Upper Rhine Valley. In June 1956 the output of Landau was 8,777 barrels of crude.

In the northern part of the Upper Rhine Valley, west of Darmstadt, Gewerkschaft Elwerath was successful in exploring three different small gas deposits in the beginning of 1956, namely Gross-Gerau, Wolfskehlen and Buettelborn, the depth being about 1,600 feet. Gross-Gerau is about nine miles north of the Stockstadt gas field. During production tests an output of about 706 mmcf of natural gas per day was measured in the exploratory well Gross-Gerau at a differential pressure of 10%. Here as in Wolfskehlen and Buettelborn the pay is in the young Tertiary.

As may be remembered, there was a gas blow-out at Wolfskehlen in August 1951. Later on it proved, however, that in the immediate neighborhood of this eruption no commercial output could be achieved. On the basis of thorough geophysical investigations carried out in the meantime Gewerkschaft Elwerath tested another block about two miles further to the northwest and sunk the wildcat Wolfskehlen 5 which was productive. In the area between Gross-Gerau and Wolfskehlen a third gas find was made with the exploratory well Buettelborn 1. It is, however, doubtful whether commercial production can be obtained at this place.

Last year we reported on a gas blow-out near Gendorf in Bavaria, which was quickly brought under control. The well was deepened and production tests on a Burdigal sand between 3,540 and 3,560 feet had a positive result. The flow was 28,000 cf of gas per hour through a 1/6-inch choke, the well-head pressure being 100 atmospheres. The hole was shut in to await further explorations.

In the eastern part of the Molasse basin an extension of the field Heimertingen of Deutsche Schachtbau and Tiefbohrgesellschaft could be achieved by the successful wells Heimertingen 6 and 7 which pump about 95 barrels of crude oil per day each. The monthly output of the field Heimertingen may soon pass the thousand tons mark monthly.

**OIL FIELDS IN HOLSTEIN AND HANOVER**

In 1955 a total of 567 deep wells were completed in Western Germany, including 107 wildcats, 77 extension wells and 383 wells in known fields. Fifteen of the wildcats found oil or gas. Thirty of the extension wells, i.e. 39%, were successful and 339 of the production wells, i.e. 88.5%, came in as oil or gas producers. At the beginning of 1956 2,808 wells were producing oil and 27 natural gas.

The total drilling footage of 1955 amounted to 2,409,140 feet. For 1956 a goal of about 2.48 million feet was set. END

*One of the biggest exploratory plays in the history of Venezuela is shaping up as dozens of independent companies prepare to join the rush for . . .*

# NEW CONCESSIONS IN VENEZUELA

For the first time since 1945 new petroleum exploration and exploitation concessions have been granted this year by the Government of Venezuela. Oil companies around the world are watching the Venezuelan scene with greater interest as a result of this step.

Although some 7.5 million acres have been applied for by companies awaiting permission to receive concessions, the first areas granted were comparatively small. During early 1956 the government gave out a small sketch map of 43 areas in Lake Maracaibo and announced that bids for exploitation would be accepted on the first 11 lots.

The response was immediate. The government has not released any official word as yet, but according to reports in Caracas the 11 blocks were all taken up, eight of them immediately and the remaining three located farthest from production, without undue delay. Bids totaled over $200 million on these 11 areas, it is reported. Although no official announcement has been made, it is reported that the following awards will be made:

The successful bidder for Lot 1 was a syndicate, formed by Sun Oil Co. and Atlantic Refining Co. The latter has had established production in Venezuela for several years. Sun has been doing general reconnaissance work during the past few months but had no producing properties.

Mene Grande Oil Co., one of the major producers in Venezuela, a Gulf subsidiary, received the largest number of lots, numbers two, three, six and 11, for a total of about 98,800 acres. Creole Petroleum Corp., an affiliate of Jersey Standard, received one lot, number five.

A syndicate composed of four independent companies, including Hancock Oil Co., Sohio Petroleum Co., Pure Oil Co. and Signal Oil and Gas Co. received lot number four of 27,000 acres. Signal and Hancock companies have been actively exploring in Venezuela during the past months, presumably doing surface reconnaissance. Signal will act as operator through Signal Exploration Co.

Cia. Shell de Venezuela received lot seven. The remaining three lots were not taken immediately but subsequently were bid on and accepted, according to unofficial reports. Shell is reported to have received number eight and Star Oil Co., composed of U.S. independents, got number nine. Venezuelan American Oil Producers Association got number ten.

Via the Official Gazette the government announced on July 4th that additional areas were open for concession bids and gave companies until July 13th to apply. This time the areas offered were National Reserves, mostly created by the earlier obligatory surrender of half of exploration areas when such areas were converted to exploitation concessions. These new areas are being offered for exploration concessions, but the petroleum code allows "Special Advantages to the Nation," which enabled specification to be made in addition to the obligations contained in the code. The areas offered were as follows:

| Location | Area in Acres |
|---|---|
| Group 75 | 7,774 |
| Part of Lot V 574 | 10,185 |
| Part of Lot V 574 | 2,078 |
| Part of Lot V 575 | 10,697 |
| Part of Lot V 575 | 1,969 |
| Part of Lot V 576 | 9,985 |
| | 42,688 |

Group 75 is located directly north of lots 1 and 2 and the remainder are directly east of lot 11. Special conditions for bids were stipulated by the government as follows: (1) minimum initial payment 5,000 Bolivares ($600) per acre; (2) royalty 16⅔%; (3) concession holders are required to refine at least 15% of production in Venezuela or establish a refinery in Venezuela alone or in partnership with another company. Companies shipping crude to Caribbean or Netherlands West Indies refineries must pay an 8% tax on sale value of production so refined. These National Reserves adjoin producing properties. In the case of Lot V574, V575, V576 they are next to Mene Grande production. The Group 75 area of 7,774 acres adjoins Creole and Shell Acreage.

Again, no official announcement is forthcoming from the government. Caracas sources stated, however, that Mene Grande received two of the tracts adjoining its acreage. They were lot V-576 (9,985 acres) and part of lot V-575 (10,697 acres).

The highest bid for exploratory rights in Venezuela to date is reported to have been made by Superior Oil Co. for a 7,774-acre concession in the National Reserves, Group 75 which is located north of lot No. 2. The company was reported to have paid about $2,550 per acre (21,000 Bolivares per hectare).

Cia. Shell de Venezuela received part of Lot V-574 (10,185 acres) in the northwest corner, adjoining acreage already held by Shell.

Venezuelan Leaseholds, C.A. reportedly received 1,969 acres of lot V-575, which adjoins producing properties held by Mene Grande. Several independent American companies, including Star Falcon Oil Co., Boger Oil Co., and Dade Petroleum Corp., and one individual, Lee Flowers of Texas, are identified with Venezuelan Leaseholds, C.A. The company has listed its shares in Venezuela on the Caracas exchange. It is a

**FIRST SIX MONTHS EXPLORATION IN VENEZUELA**
**(Party Months)**

| | Jan. | Feb. | Mar. | Apr. | May | June | Total |
|---|---|---|---|---|---|---|---|
| Seismic | 17.0 | 18.5 | 18.5 | 17.0 | 16.0 | 10.5 | 97.5 |
| Geological | 12.0 | 13.0 | 11.5 | 11.5 | 12.0 | 8.0 | 68.0 |
| Gravity | 2.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 | 15.0 |
| Scintillator | 1.0 | 1.0 | 1.5 | — | 1.0 | 1.0 | 5.5 |
| Stratigraphic | 1.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 | 14.0 |
| Magnetometer | 1.0 | 1.5 | 1.0 | 1.0 | 1.0 | 1.0 | 6.5 |
| Total | 34.0 | 38.0 | 36.5 | 35.5 | 36.0 | 26.5 | 206.5 |

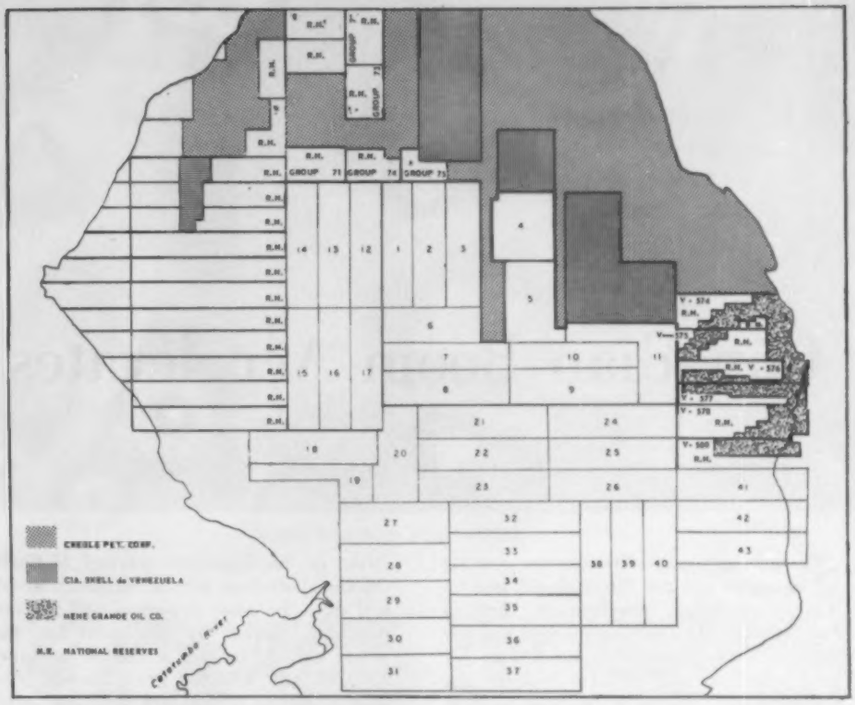
subsidiary of Venezuelan Leaseholds Inc. of the Bahamas, headed by Leon I. Ross, an investment banker. H. Brandt is president of the subsidiary.

Venezuelan American Independent Oil Producers Assoc. reportedly received 2,078 acres in Lot V-574. The composition of this company is unknown at present.

Venezuelan Leaseholds C.A. received 1.969 acres in Lot V-575, adjoining producing properties held by Mene Grande Oil Co. It is a subsidiary of Venezuelan Leaseholds, Inc. of Nassau, Bahamas. The parent company reportedly has $10 million capital and is made up of L. I. Ross, an investment banker, Henrique J. Brandt, a Caracas businessman and president of A. Planchart and Cia., and Sir John Calden, broker for the Bahamas company. A. E. Boger, president of the Boger Oil Co., Oil City, Louisiana, will direct Venezuelan operations which are to be managed by Star Falcon Oil Co., of which he is also president. Venezuelan Leaseholds is described as being active principally in making the necessary contracts with the government agencies concerned with obtaining concessions. It is headed by Mr. Brandt, with Dr. Antonio Sanchez Vegas as vice president. The company will work with a group of American, Canadian, Anglo-Canadian and European companies, according to its recent statement. Dade Petroleum Corp. and Lee Flowers of Texas are also identified with the company. Shares were listed on the Caracas exchange at four Bolivares per share and have appreciated considerably since. The company has bids for other concessions in Anzoategui, Monagas, Guarico, Zulia and Apura and plans to drill about 10 wells this year, according to Mr. Brandt, with a total investment of around $10 million. He stated the company would operate under conditions similar to those of other companies in Venezuela but did not say whether it would actually engage in operations or farm out its areas to other companies.

The Star Oil Co., organized by Joseph Davidson of Washington, D.C., and Dallas, received a 20,395 acre concession near the Mara field in northwestern Venezuela. The company's bid was reportedly about $1,882 per acre.

This was the first of the border concessions which are being awarded. The government has specified minimum conditions for these areas, which are all in the form of exploration concessions. Initial bonus per acre was put at about $12.08 per acre, rising by one-third when the concession is converted to exploitation in three years. The areas reportedly cover all the western and southwestern border of Venezuela, adjoining Colombia, and excluding only the mountainous areas. Of the 16 original companies known to have applied, concession applications for 12 have been published in the Official Gazette. They include bids by Creole, Mene Grande, Shell and Sun companies, plus one by Venezuelan Leaseholds.




*Concession acreage in Lake Maracaibo. Numbered lots are those designated by the government as areas which may be given under concession in the near future. Shaded areas are development concessions held by the indicated companies.*

Not all companies contain U.S. capital. A Spanish company, Cia. Iberica de Petroleos, S.A. is reportedly interested in concessions and Petroleo de Venezuela, controlled by Deutsche Erdol A. G. of Hamburg, reportedly entered a bid. A French company, known as Inversiones Venezolanas S. A. also is interested. A representative of Teikoku Oil Co., Tokyo, is expected to submit bids for this company.

Stanolind Oil and Gas Co. recently indicated its interest by registering in Caracas. The company has not been in Venezuela since selling out its interest in Lake Maracaibo properties about 24 years ago and has not announced any plans as yet to bid on concessions.

Apart from these grants, considerable surface reconnaissance, and drilling exploration is being done on acreage held by the companies previously. During the first six months of 1956 a total of 206.5 party months of geophysical exploration was conducted, as shown in the accompanying tabulation. Drilling totaled 617 wells in the first half of 1956, of which 515 were oil wells for development and 30 were wildcats. Four development wells and one wildcat found gas. Of the total, 29 development wells and 38 wildcats were dry. Activity was slightly higher in the second quarter, when 319 wells were drilled.

Production in Venezuela during the first six months of 1956 averaged 2,363,900 b/d., about 9.6% above the average for 1955. Monthly production figures are:

| | | | |
|---|---|---|---|
| January | 2,324,485 | April | 2,313,700 |
| February | 2,352,744 | May | 2,446,157 |
| March | 2,384,000 | June | 2,362,871 |

Refining in Venezuela during the first quarter of 1956 rose to 595,716 b/d, which is 11.5% over 1955 levels. Exports of petroleum during the first quarter averaged 1,744,968 b/d of crude, plus 457,286 b/d of products. END

**DRILLING IN VENEZUELA—FIRST HALF 1956**

| | Oil | | Gas | | Dry | | Total |
|---|---|---|---|---|---|---|---|
| | Development | Wildcat | Development | Wildcat | Development | Wildcat | |
| Creole | 53 | 7 | — | — | 3 | 6 | 69 |
| Mene Grande | 145 | 9 | 1 | — | 3 | 3 | 161 |
| Shell Group | 177 | 3 | — | — | 5 | 3 | 188 |
| Sinclair | 22 | 4 | — | — | 1 | 5 | 32 |
| Texas | 13 | 2 | — | — | 1 | 2 | 18 |
| Los Mercedes | 16 | 3 | 1 | — | 9 | 11 | 40 |
| Socony | 22 | — | — | — | — | — | 22 |
| Atlantic | 4 | 2 | — | — | 1 | 6 | 13 |
| Phillips | 26 | — | 2 | 1 | — | 2 | 31 |
| Richmond | 25 | — | — | — | 3 | — | 28 |
| Pantepec | 1 | — | — | — | — | — | 1 |
| Talon | 11 | — | — | — | 3 | — | 14 |
| Totals | 515 | 30 | 4 | 1 | 29 | 38 | 617 |
| Totals (2nd quarter) | 263 | 17 | 1 | 1 | 16 | 21 | 319 |

*Drilling and production activities reached new peaks in the first half of 1956. Wildcats were 33 percent successful. In Pembina 453 wells were drilled without a dry hole. Production was 38 percent higher than last year.*

# Canadian Boom Accelerates

**By Leslie Orr Rowland**[1]

SPARKED by a major first quarter opening of export markets for crude oil, and by the phenomenal development drilling campaigns in the Pembina oil field and the composite southeastern Saskatchewan region, the first half of 1956 brought the Canadian oil industry its highest level of drilling activity in history and the promise of the largest increase in oil production volume ever recorded for the full year. The amount of capital investment being poured into all primary phases of the industry will set new records far above the traditional "million dollars a day" established three years ago, and total investment in exploration, drilling, production equipment, pipe lines and refineries should easily top the billion dollar mark for 1956.

Production figures for the first quarter showed a rise of 45% over the same period of 1955, as Saskatchewan more than doubled its output and Manitoba and Alberta added 60% and 40% respectively. The first quarter total of 41,194,620 barrels for the prairie provinces compared to 28,471,698 in the 1955 first quarter. Production outside this region is negligible, amounting to less than half a million barrels. The daily average climbed to 452,688 b/d, in sharp contrast to the 315,241 b/d produced last year.

The strong pace set in this period was largely accounted for by the tremendous increase in the export market for crude on the Pacific coast and in the northern states, Canada's most non-controversial channels for international movement of oil. From last year's start with the very modest figure of 23,070 b/d, all from Alberta, exports soared to an estimated 120,000 b/d in the first quarter this year. The export market was responsible for some 75% of the gain in total Canadian crude oil production, the domestic market expanding by only one third as much.

The significance of exports was fully appreciated in the second quarter, when the strike at the Anacortes refinery of Shell Oil Co. slashed an average of about 40,000 b/d from the coast shipments and cut the American market by one third for the whole period, causing a loss of between 3,500,000 and 4,000,000 gross barrels. Although official figures are available only through April, it appears from analysis of refiners' nominations of Alberta crude, and projections of Manitoba and Saskatchewan unofficial reports, that second quarter production was down 11% from the first, at an estimated 36,600,000 barrels or 402,200 b/d. Thus the loss of American business alone did not account for all the decline, which was accentuated by the normal seasonal reduction in domestic production at this time of year.

Compared to the production rate for the second quarter of last year, 1956 growth slowed down substantially, with an increase of only 31% across the board, made up of a 25% rise for Alberta (the only province affected directly by the refinery strike), 87% for Saskatchewan and 67% for Manitoba. The total production was divided: 30,994,020 barrels for Alberta, 4,250,000 for Saskatchewan and 1,337,209 for Manitoba. The daily average of 402,200 b/d, compared to 307,008 b/d for the second quarter of 1955, was not far out of line with industry estimates made last December, as exports of light gravity crude from Alberta to the Minnesota refineries supplemented the medium gravity oil taken from Saskatchewan. This helped somewhat to make up for the loss of the Anacortes market.

Exports to the United States in the second quarter are estimated at 90,000 b/d, so that in this period they dropped to 22½% of the total market for Canadian crude, from 26½% in the first quarter. A significant feature of the entire first half was the inauguration of offshore shipments from the Vancouver terminal of Trans-Mountain Oil Pipe Line Co., direct by tanker to California refineries. This development brought to reality one of the basic economic principles which the builders of Trans-Mountain had in mind to justify the pipe line across the Rocky Mountains. Although the shipments have been spread out at rather long intervals, although they are all intra-company arrangements when return tanker space is available which would otherwise go in ballast, and although there is no indication yet that Canadian crude is competitive in an unrestricted market in California, the long-range prospect of successful invasion of this large and expanding market cannot be ignored.

The first half total production of 77,794,620 barrels marks an increase of 21,385,219 barrels over the first half of 1955 and indicates that refiners' estimates of a market for 163,000,000 barrels in the full year will be realized with probably a slight excess. The increase for the second half will not be so impressive, as last year's second half was inflated by the opening of several new outlets which had not taken crude from Canada before and this year's prospects for any such new business are very meager. However it appears likely that the increase of 33 million barrels in 1955 production over 1954 will be exceeded by more than the original calculation of 34 million barrels for 1956 over 1955.

Well drilling in the 1956 first half far exceeded expectations, although the late spring and unusually prolonged road bans in all prairie provinces held operations back until the latter part of May. In British Columbia the scheduled expansion in gas well drilling, required to meet the demand of large volume traffic through the Westcoast Transmission Company, Ltd. natural gas pipe line to the Pacific coast, did not get underway until June. In spite of these limitations imposed by the forces of nature, the first half wound up with an increase over 1955 and with the number of active drilling rigs at an all time high of 254.

The outstanding features of first half well completions were the tremendous outburst of drilling in the gigantic Pembina field of northwestern Alberta, the continuation of the sensational wildcat discovery rate in the southeastern sector of Saskatchewan, and the enormous increase in development drilling in this region as a result of the remarkable discovery ratio scored last year.

Total well completions in the first half numbered 1,306, compared to 1,188 last year in the same period, an increase of 11%. The first half is normally the period of lesser activity, and the indicated total of completions for the whole year is well over 3,000, with forecasts running as high as 3,600.

Alberta continued out in front with 866 completions, or 65% of the total, as Pembina field development dominated the drilling and accounted for 453 wells. This was more than half the total of all wells drilled and 63% of the 720 development wells in the foothills province. A remarkable feature of Pembina drilling was the absence of any dry holes as every well was an indicated oil producer. By the end of June this

[1] *Editor, Oil in Canada*

field, now obviously the largest ever discovered in Canada and one of the largest on the continent, contained more than 1,200 wells capable of producing, and its development was no more than one-third completed, according to minimum engineering and geological surveys.

Alberta's 146 wildcats resulted in 23 oil discoveries, 20 gas discoveries and 103 dry holes. In Saskatchewan there were 14 oil discoveries and 79 dry holes out of 93 wildcats, while Manitoba recorded only two discoveries of oil with 14 dry holes for a total of 16 wildcats. No discoveries were made in British Columbia, where six dry holes were drilled.

Saskatchewan drilling totalled 329 wells, including 236 development wells. In Manitoba the count was 95 wells, including 79 development wells. Compared to last year's first half, Alberta drilling was up 37%, Saskatchewan down 15% and Manitoba down 33%. The latter two provinces suffered disproportionately from the prolonged winter weather.

The figures in bulk do not reveal the significant shift of emphasis in Saskatchewan to the southeastern corner, but when this area is taken by itself the score of 165 development wells in the first half of 1956, or 70% of all development wells drilled in the whole province, illustrates the enormous concentration of interest which has brought the number of active rigs to 70 as of the end of June in the territory bounded by lines drawn 110 miles west of the Manitoba border and 40 miles north of the international boundary.

This region and Pembina were shaping up throughout the first half of the year as the dominant development area, and June completion figures showed the extent of their activity with 99 Pembina development wells and 54 southeast Saskatchewan completions out of 260 in western Canada.

Discoveries in southeastern Saskatchewan in the first half of the current year set a blistering pace which has probably never been matched for intensity in any region of the world for such a sustained period in such a concentrated area. Out of 18 wildcats drilled, eight made discoveries of oil and 10 were dry holes. Imperial Oil Ltd., the principal operator in the region, made the remarkable record of seven discoveries out of 11 wildcats completed.

There were 70 drilling rigs working in the southeastern sector at the end of June, just about equal to the number in Pembina, and the current completion rate had stepped up to better than two a day for development wells. The combined effect of these two sensationally active regions was to bring the total number of drilling rigs in western Canada up again to the peak of 270 which was last attained in the summer of 1953.

Footage drilled, climbing with the increased well completions, set a high mark of 6,264,259 feet, compared to 5,980,435 feet in the first half of 1955. Unless the effect of the steel strike in the United States is felt very severely in the last quarter, footage should increase with well completions in the second half to exceed 14,000,000 feet.

*Drilling Mast in the Pembina Field*

There were no outstanding discoveries in the first half of 1956 in oil, capable of immediate evaluation, but several major extension discoveries in southeastern Saskatchewan, notably to the Alida, Weyburn and Steelman fields, raised tentative reserve estimates of oil in place in this prolific region to at least one billion barrels on the strength of productive area delineated by wells drilled up to the end of June. In Pembina, the extension discovery successes and the weight of development drilling in an unusually good operating season combined to raise the cumulative development to the level which had been forecast two years ago for the end of 1958.

Pipe line construction had a remarkable season for the first half, with several major jobs under way. The outstanding contract was for the 650-mile 30-inch Westcoast Transmission Co., Ltd. natural gas pipe line from the Peace River region fields to the Pacific coast, serving Vancouver and cities in Washington, as well as the whole interior of British Columbia. This line will be completed in 1957. The Westspur Pipe Line Co. crude oil line in southeastern Saskatchewan, completed early in July, is strategic for its potential traffic of upwards of 50,000 b/d within a short time as the fields develop. There is already talk of a loop next year of its entire 109 miles of 12-inch pipe. A major loop of 67 miles of the Interprovincial Pipe Line Co. main line in Manitoba will bring the whole line into balance and permit maximum throughput of 241,500,000 b/d. Construction of an additional pumping station on the Trans-Mountain Oil Pipe Line Co. main line will bring its capacity up to 150,000 b/d for immediate use.

Two large northern Alberta gas pipe lines are due for completion in the fall, to serve a new pulp and paper mill at Hinton, in the Rocky Mountains 200 miles west of Edmonton. In Saskatchewan a network of extensions and feeder lines involving altogether 250 miles of main and branch line construction and more than 2,000,000 feet of city and town distribution lines is nearing completion as the 1956 program of Saskatchewan Power Corp. Included is a 12-inch main line from the Success gas field to Moose Jaw, which is due for extension to more gas fields to the west and additional markets to the east by next year.

The failure of the project of Trans-Canada Pipe Lines, Ltd. for its 34-inch natural gas pipe line from Alberta to Winnipeg did not make very much impact on the pipe line contractors, most of which were already fully occupied. Trans-Canada got two spreads to work early in July to start laying the 127 miles of pipe which it was able to secure before the steel strike, but is expected to have to suspend in the early fall when this pipe runs out, unless an unexpectedly early end of the strike permits resumption of deliveries in time to justify going ahead before the 1957 construction season.

The Trans-Canada project is noteworthy as the first pipe line construction in Canada to use 34-inch pipe, and the two contractors holding the first two sections east of Alberta are experimenting successfully with the new model pipe-layers to handle this extra large pipe. At least ten of these rugged tractors are working on the two spreads. In spite of proration problems, salt water disposal orders, and the potential trouble arising out of shortage in steel items later in the summer, Canadian oil operators in all divisions were looking forward at mid-year to the best second half in their history. END

*D. M. Pilcher, director of the Petroleum Information Bureau (Australia) was appointed that position in 1954 after 25 years' experience in financial and political journalism in Australia, New Zealand and the United States. He is a graduate in economics of the University of New Zealand. For some time after World War II he was senior editor of the department of public information of the United Nations at Lake Success, New York.*

# THE AUSTRALIAN PETROLEUM

**By D. M. Pilcher**

SINCE the Second World War consumption of petroleum products in Australia has risen from 705 million imperial gallons a year to 1,937 million gallons, an increase of 175%. Over the period from 1946 to 1955 the population has grown from 7,500,000 to 9,300,000.

This means that consumption per person per year has risen from 94 to 208 imperial gallons. The basic reasons for this tremendous jump in the demand for petroleum products are the increased prosperity and expanding economy of this country.

Immediately following the war, the world demand for Australian primary products was very strong and prices were high. This demand has now passed its peak and prices, most importantly those for wool, have fallen, but Australia's trade position is still good.

High prices for Australia's exports have brought great prosperity to the country. Australians have money to spend both on consumer goods and services. Most families now have a car, most people can afford to travel by airplane with an increased demand for petroleum products as a direct result. Australians have also made big investments in the industries producing the consumer goods and services and Commonwealth and State Governments have undertaken major public works to the extent of $672 million a year. The number of factories in Australia increased from 31,000 in 1946 to 50,000 in 1954. Consequently there has been a greatly increased demand for energy and petroleum products have played a major part in meeting this demand.

The Australian market for black products is of a somewhat different nature to that for white products. In most cases there is no real substitute for white products in the uses to which they are put. Most motor cars can use only motor gasoline and airplanes are, at the moment, built to run on aviation or jet fuel. But with many of the uses to which the black fuels are put, for

*The 268-foot thermal catalytic cracking unit at Standard-Vacuum's £22 million refinery at Altona, 10 miles from Melbourne, is a dominating landmark on the city's shoreline.*

# MARKET

instance, heat raising in industry or in locomotives, coal is a potential alternative fuel.

In fact, the growth in demand for black oils is not only growing as industry and services expand but is, in some cases, taking the place of coal. The ready availability of oil fuels, together with ease of handling, make them attractive to industry. In some cases, with the railways, for instance, they have proved more economical.

The supply position has changed greatly since 1946. In that year Australia refined only 6% of its petroleum needs. The remainder were imported. Four great new refineries have been built since then and last year 64% of products consumed were refined in Australia.

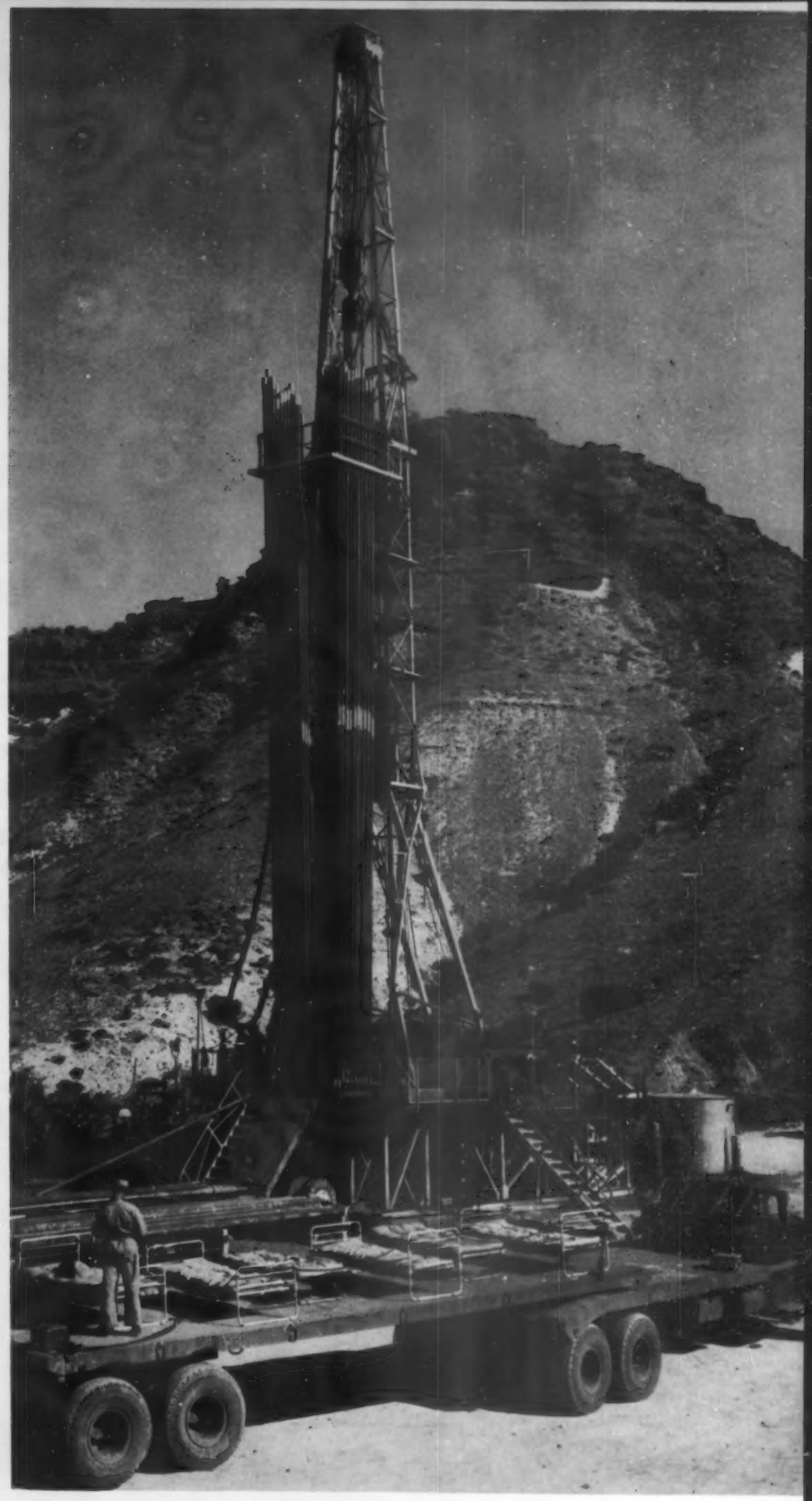
By the end of this year when the new refineries are in full production this country will be producing more black products than are needed for its own use, about 90% of motor spirit consumed and a large proportion of other products.

From 1946 to 1955 consumption of aviation gasoline in Australia rose by 75%. (See Table I.) It is not surprising that in a country of long distances, air transport has become so important. In 1946 Australian airlines carried 525,000 passengers. By 1955 they were carrying over two million a year.

Australia is second only to the United States in passenger miles flown per head of population. According to the latest figures available, those for 1954, United States airlines flew 127.4 passenger miles per head of population and Australia 109.1 miles. In the transport of passengers, freight and mail combined Australia leads the world.

In the past, all aviation gasoline has been imported. Recently however, an alkylation unit came on stream at the Standard-Vacuum refinery at Altona, Victoria. When the unit is in full production it is expected to produce 20 million gallons of aviation gasoline a year.

The introduction of jet aircraft to Aus-



*In the rugged, sunburned country of Rough Range, Western Australia, Australian-American drilling crews carry on the constant search for oil. Shown is a rig belonging to Western Australia Pty, Ltd. a joint Caltex-Aminol exploring company that will drill 24 exploratory wells this year.*

*Australia's locally made operational fighter—The Avon Sabre—combines the best features of American and British aircraft, having a fuselage similar to the Sabre F-86 and a British Avon engine.*

**TABLE I**

**AVIATION GASOLINE CONSUMPTION**

| Year | Consumption ('000 Imp. Gals.) | Percentage Change |
|---|---|---|
| 1946 | 25,082 | |
| 1947 | 24,673 | + 2 |
| 1948 | 28,695 | +16 |
| 1949 | 32,066 | +12 |
| 1950 | 34,602 | + 8 |
| 1951 | 38,603 | +12 |
| 1952 | 38,643 | + .1 |
| 1953 | 39,260 | + 2 |
| 1954 | 42,564 | + 9 |
| 1955 | 43,982 | + 3 |
| 1956 | 45,500 | + 3 |
| 1957 | 39,600 | —13 |
| 1958 | 40,000 | + 1 |

**TABLE IV**

**LIGHTING KEROSINE CONSUMPTION**

| Year | Consumption ('000 Imp. Gals.) | Percentage Change |
|---|---|---|
| 1946 | 22,475 | |
| 1947 | 26,321 | +17 |
| 1948 | 28,077 | + 7 |
| 1949 | 35,552 | +16 |
| 1950 | 35,324 | + 8 |
| 1951 | 44,763 | +27 |
| 1952 | 48,193 | + 8 |
| 1953 | 49,016 | + 2 |
| 1954 | 51,293 | + 5 |
| 1955 | 54,800 | + 7 |
| 1956 | 57,147 | + 4 |
| 1957 | 59,500 | + 4 |
| 1958 | 62,000 | + 4 |

tralia in 1950 created a demand for a special type of petroleum fuel. A number of jet planes are used by civil airways and all operational units of the RAAF are equipped with jet aircraft. It is expected that the current growth of civil air transport of both passengers and freight, about 10% increase per annum, will be maintained and possibly increased in the future. (See Table II.)

The demand for motor gasoline has risen by 545 million gallons since 1946 or by 165%, as shown in Table III. In 1946 there were less than one million motor vehicles on our roads. Now there are over two million, or one motor vehicle for every 4.2 persons in Australia compared with eight persons per vehicle in 1946. In 1950, the year in which gasoline rationing was finally abandoned, drivers were using an average 362 gallons per vehicle, in 1955 an average of 395 gallons, so the number of gallons used, per vehicle, as well as the number of vehicles on the road has increased substantially.

Immediately after rationing was abandoned, the motor gasoline market increased rapidly. Naturally, this rate of expansion could not be maintained but the market has been buoyant with annual increases in

**TABLE II**

**AVIATION TURBINE FUEL**

| Year | Consumption ('000 Imp. Gals) | Percentage Change | Refinery Production ('000 Imp. Gals) | Production as Percentage of Consumption |
|---|---|---|---|---|
| 1950 | 238 | | — | — |
| 1951 | 1,012 | +325 | — | — |
| 1952 | 1,862 | + 84 | — | — |
| 1953 | 2,773 | + 49 | 382 | 13.8 |
| 1954 | 5,301 | + 91 | 202 | 3.8 |
| 1955 | 13,696 | +158 | 2,401 | 17.5 |
| 1956 | 20,500 | + 53 | | |
| 1957 | 24,350 | + 19 | | |
| 1958 | 28,100 | + 15 | | |

**TABLE III**

**MOTOR GASOLINE**

| Year | Consumption ('000 Imp. Gals) | Percentage Change | Refinery Production ('000 Imp. Gals) | Production as Percentage of Consumption |
|---|---|---|---|---|
| 1946 | 330,184 | | 9,381 | 2.8 |
| 1947 | 397,830 | +20 | 42,776 | 10.8 |
| 1948 | 407,348 | + 2 | 62,948 | 15.5 |
| 1949 | 460,560 | +13 | 79,504 | 17.3 |
| 1950 | 542,101 | +18 | 77,594 | 14.3 |
| 1951 | 633,881 | +17 | 94,437 | 14.9 |
| 1952 | 680,927 | + 7 | 97,280 | 14.3 |
| 1953 | 720,940 | + 6 | 107,892 | 15.0 |
| 1954 | 803,757 | +11 | 243,759 | 30.3 |
| 1955 | 875,347 | + 9 | 455,577 | 52.0 |
| 1956 | 936,000 | + 7 | | |
| 1957 | 992,000 | + 6 | | |
| 1958 | 1,058,000 | + 6 | | |

**TABLE VI**

**LUBRICATING PRODUCTS**

| Year | Consumption ('000 Imp. Gals) | Percentage Change | Refinery Production ('000 Imp. Gals) | Production as Percentage of Consumption |
|---|---|---|---|---|
| 1946 | 24,200 | | — | |
| 1947 | 30,700 | +27 | — | |
| 1948 | 32,900 | + 7 | — | |
| 1949 | 36,700 | +12 | 7,623 | 4 |
| 1950 | 36,574 | — .3 | 5,724 | 16 |
| 1951 | 39,720 | + 9 | 7,873 | 20 |
| 1952 | 40,304 | + 1 | 6,146 | 15 |
| 1953 | 40,259 | — .1 | 3,850 | 10 |
| 1954 | 43,801 | + 9 | 6,916 | 16 |
| 1955 | 48,110 | +10 | 8,868 | 18 |
| 1956 | 51,000 | + 6 | | |
| 1957 | 52,500 | + 3 | | |
| 1958 | 54,000 | + 3 | | |

**TABLE V**

**POWER KEROSINE**

| Year | Consumption ('000 Imp. Gals) | Percentage Change | Refinery Production ('000 Imp. Gals) | Production as Percentage of Consumption |
|---|---|---|---|---|
| 1946 | 63,333 | | 3,328 | 5.3 |
| 1947 | 78,424 | +24 | 3,636 | 4.6 |
| 1948 | 82,014 | + 5 | 3,637 | 4.4 |
| 1949 | 80,319 | — 2 | 2,869 | 3.6 |
| 1950 | 78,270 | — 3 | 243 | .3 |
| 1951 | 78,408 | + .2 | 34 | .04 |
| 1952 | 71,570 | —10 | 249 | .4 |
| 1953 | 75,717 | + 6 | 174 | .2 |
| 1954 | 77,798 | + 3 | 199 | .3 |
| 1955 | 78,098 | + .4 | 1,957 | 2.5 |
| 1956 | 77,000 | —15 | | |
| 1957 | 77,200 | | | |
| 1958 | 77,400 | | | |

excess of prewar rates. Import restrictions on motor vehicles imposed early this year may depress the rate of increase in 1956, but it is expected that consumption will increase not by less than 6% per annum over the next few years.

In 1946 only a fraction of Australian motor gasoline consumption was met by local production. In 1955, over half the motor gasoline consumed was locally produced and, by the time the new refineries are in full production, it is expected that probably 90% of demand will be met by local output.

The demand for lighting kerosine has more than doubled since 1946. About 85% of lighting kerosine consumed is used for domestic purposes. Gas and electricity rationing after the war gave a great impetus to the domestic kerosine heaters. These are such an economical source of heat that demand is continuing although at a slightly retarded rate. (See Table IV.)

So far no lighting kerosine has been produced in Australia but it is expected that about six million gallons a year will be refined from now on.

The demand for power kerosine has risen only 23% over the period 1946-55, and less than that for any other product. (See Table V.)

More than 90% of power kerosine consumed is used as fuel for tractors. The number of tractors in use in Australia since the war has risen steeply, but to an increasing extent diesel tractors have been replacing power kerosine units on heavy agricultural work.

This development, together with the variation in annual wheat acreages, accounts for the recent fluctuations in what is normally a stationary market for power kerosine. It is expected that there will be a fall in power kerosine consumption in 1956 and a more or less stationary market in future years.

Throughout the post-war period Australia has become much more intensively mechanized; on the farm, on the road, and in industry. This has created a tremendous demand for lubricating products, with consumption doubling between 1946 and 1955. (See Table VI.) About one fifth of the demand is now met by local production. In many cases two or all of distillate, diesel and fuel oils may be used for the same purpose, in ship's bunkers, for instance or in gas making, so they are discussed together.

There has been a very great increase in the consumption of black fuel oils since 1946. The consumption of distillate has risen by 459%, of diesel oil by 72% and of fuel oil by 447%. (See Table VII.)

Immediately after the war there was insufficient black coal to meet the needs of industry and the consumption of black oils rose rapidly. In the middle of the period under review, when greater supplies of black coal became available, consumption tended to drop but has begun to rise again, over the last two years. (See Table VIII.) In 1955 the demand for fuel oil rose by more than half.

The latest annual report of the Joint Coal Board shows that in New South Wales, Victoria and South Australia the proportion of total fuel requirements met by petroleum products has risen from 7½% to 17% between 1945 and 1955.

Distillate, diesel and fuel oil are all used as ships' bunkers. The following table shows the amounts used for the purpose in 1946 and 1955.

The amount of all oils used for bunkering in Australia has doubled since 1946. The amount of distillate used for bunkers has dropped but that of the other two products has risen. One percent of all distillate consumed is used for bunkers, 25% of all diesel oil and 39% of all fuel oil. (See Table IX.)

In 1946, 99% of fuel oil consumed was used as bunkers. In spite of the fact that the quantity now used for bunkers has more than doubled only 39% of fuel oil consumed now goes to ship's bunkers.

This increase in the use of oil for bunkers over the last ten years is explained by the increase of shipping in Australian ports

(*Continued on page* 112)

*Australia's first plant for aviation fuel at Altona, Victoria, was officially opened late in May. It can produce 42% of Australia's requirements. Shown are raw materials from which the aviation gasoline is made stored in "Horton's Spheres."*

*Sedimentary terrain favorable to oil accumulation in the franc area approximately equals that of the United States. Despite this, the area's oil production is only a fraction as large. The situation is aggravated by rising oil needs which have tripled France's consumption in the past 15 years. To improve this situation the government has undertaken an active campaign, designed to stimulate . . . .*

# Increased Exploration in the Franc Area

**By Dr. Jean Devaux-Charbonnel**

THE need for oil exploration in the franc area is based on the increase in world oil consumption, which has risen from 1,998,000,000 barrels in 1938 to nearly 5,698,000,000 barrels in 1955. Consumption in France itself has increased even more rapidly and has tripled during the same period from 44 million to 148 million barrels.

French production is negligible in proportion to the country's needs: not until 1955 did it reach more than 7 million barrels, covering only a twentieth part of French consumption. At present France has to import the greater part of crude necessary for refining. This involves her in a heavy outlay of hard currency.

This low production level is not due to any lack of potential oil basins in the franc area. Recent surveys estimate the total area suitable for exploration at 13 million square miles, roughly the equivalent of the comparable area in the United States. All parts of such an area would not be equally promising, but it would be surprising if exploration did not lead to discovery of oil in this area more than sufficient to cover France's needs.

It is also strange to record that 20 years ago no one believed in the existence of oil in France, and that France, the cradle of the combustion engine, the motorcar, and the airplane, was slow to secure supplies of the energy so necessary for the expansion of her economy.

Immediately after the First World War, the treaty of San Remo gave France, by way of compensation for the war damage she had suffered, the holding in the Turkish Petroleum Co. (now the Iraq Petroleum Co.) formerly owned by Germany. This holding gave her the right to a quarter of the oil production of the former Turkish Empire.

Compagnie Francaise des Petroles was then formed, with full powers to exercise the rights of the French State. This share in the production of Iraq Petroleum Co. has helped to reduce, particularly during recent years, French dependence on foreign sources of oil supply; in 1955 supplies from Iraq covered approximately one-third of the total consumption in the franc area.

During the same period, partly thanks to the help of various international combines, a refining industry was set up on French soil (and thus close to the centers of consumption) in order to supply the market direct with products.

France was the first country to do this, and her example was followed by Great Britain, among other countries, after the Second World War. Oil exploration in French territory remained, however, at very low levels. Compagnie Francaise des Petroles, entirely taken up with the business of refining and transportation, had neither its present resources, which would have enabled it to brave the risks of oil prospecting, nor the necessary technicians, and the international companies were too busy developing oilfields in Venezuela and the Middle East, to help, outside of refining.

*Dr. Jean Devaux-Charbonnel is the Legal and Financial Councelor of the principal governmental oil agency in France, the Bureau de Recherches de Petrole. He recently completed a two-months stay in the United States, Canada and Mexico during which he made a comparative study of legislation relating to the production, transportation and marketing of oil and gas. During his visit much interest was expressed by American oil men in oil possibilities of the franc area. Their inquiries prompted Dr. Charbonnel to write this article for* WORLD PETROLEUM, *which arranged part of his itinerary, and thus partially repay the very generous aid he received from American companies.*

In addition, as already stated, nobody believed in the existence of oil in France. Derricks seemed little in keeping with the quiet beauty of French scenery—they were more in place in the desolate wastes of Iran and Arabia.

However, some research had been carried out under the aegis of a public body, the National Bureau of Liquid Fuels, set up immediately after the First World War. This had led to the discovery in 1924 of a small field, soon exhausted, at Gabian in the south of France; and in 1934, somewhat better results were obtained in Tselfat, in Morocco.

In addition, the Pechelbronn company, handed back to France together with Alsace, was developing one of the oldest fields in Europe, and was trying to develop other sources of oil.

All this, however, only amounted to a yearly yield of barely 550,000 barrels. It was not until 1937 that the State adopted a proper exploration policy under the guidance of an energetic Minister, M. Paul Ramadier, Minister of Finance and Economic Affairs in the present government.

A fairly full research program was drawn up and was to be carried out by a subsidiary organ of the National Bureau of Liquid Fuels, the Oil Research Center of the Midi (South). By great good fortune the second wildcat well (St. Marcet No. 1), drilled on the advice of one of our foremost geologists, Professor Leon Bertrand, revealed on July 14, 1939 a gas deposit of very high pressure, which during the first tests yielded 6,354,000 cubic feet per day. On July 29, 1939 the Regie Autonome des Petroles was set up, a State company to which was received an exploration prospecting area permit to develop this discovery.

Another result, quite as important as this successful well, was the decisive reversal

of the irrational opinion held in France regarding the production possibilities of the French subsoil. Oil exploration research in France still had difficulty in getting under way, however. During the German occupation, various prospecting ventures were carried out in such a way as to be as unproductive as possible. The chairman of the Regie Autonome des Petroles, M. Pierre Angot, and also the chairman of Compagnie Francaise des Petroles, M. Jules Meny, paid with their lives for refusing to cooperate with the Germans.

By the end of the Second World War the oil industry had unfortunately, although much to its credit, paid a heavy toll both as regards equipment and the best of its men; two-thirds of its refineries had been destroyed, three-quarters of its tankers sunk, and its distribution system dislocated. Much reconstruction had to be done.

With American aid, France made a remarkable effort to this end. In 10 years she not only retrieved her pre-war resources, but had quadrupled them. In order to meet the growing power requirements, her refining capacity increased to 175 million barrels in 1955, and tanker fleet to nearly 1,800,000 dwt.

Despite the work undertaken in this respect, exploration was not neglected. After the liberation a far-sighted Minister, M. Robert Lacoste (at present Minister for Algeria) saw to it that the State promoted exploration. This development benefited by the legal system under which it was to be regulated.

Most of the mining laws in the different countries of the Franc area had already been amended between the two wars to meet the requirements of the exploration and production of hydro-carbons—for example, the Metropolitan law of Dec. 16, 1922. The laws were amended in Tunisia in 1948, in the Overseas Territories in 1954, and in Metropolitan France and Algeria in 1955.

One of the basic principles of French mining law is that the mines do not belong to the owners of the land, but to the State, which disposes of them as it thinks best and is empowered to lay down regulations governing mining activities, and thus to grant licenses for exploration and production.

The authors of this legislation, traditionally generous in the matter of mines, aimed not at creating public or private monopolies, but at encouraging free competition between prospective explorers while safeguarding the country's interests.

First and foremost, care is shown in the granting of exploration licenses, technical and financial capacities being taken very carefully into consideration. The prospectors' natural desire to profit from any discoveries, for which large sums of money have sometimes to be expended, was taken into account by assuring the automatic granting of the licenses necessary for developing the wells.

Holders of exploration licenses are obliged by the law to agree to the following measures, which are designed to organize their work in the best interests of the nation: minimum works program; automatic reduction of the license area at each renewal; and obligatory request for a concession in the case of discovery. On the other hand, every facility is accorded to the prospectors in carrying out their work; exclusive right of carrying out prospection within the license area, right to occupy the necessary areas for exploration, and unhindered disposal of production. Exploration licenses with an initial validity of five years or under may be prolonged if the holder has fulfilled all his obligations; as a general rule, no license runs for more than 15 or 20 years.

Production cannot be carried out without a license granted by the public authority concerned—either a concession or, in the case of small wells, a production license. The rights and obligations of concessionaires are laid down in a Memorandum of Obligations drawn up between the State and the prospector. This is usually valid for about 50 years, after which time the well is once more State property. The Memorandum of Obligations provides for a certain number of technical, economic and financial obligations: the obligation to produce under the most favorable conditions and to explore exhaustively in the concession area; to satisfy the needs of the country and to construct refineries; to pay progressively mounting royalties on all production, up to a maximum of a fifty-fifty share of the profits of the venture, the other fiscal charges borne by the prospector being taken into account.

Judging by the number of applications for exploration licenses already granted or under consideration, these legal provisions seem to encourage exploration, especially in Metropolitan France and Algeria. The area covered by licenses represents a quarter of the area of the sedimentary basins. Much still remains to be done, however, for although two-thirds of these basins in Metropolitan France are under exploration nine-tenths of the basin area in the Overseas Territories is still untouched.

But the interest in French oil exploration which has developed in recent years, thanks to the successful results obtained, would not have expanded so rapidly had not the relevant legislation been so framed as to encourage explorers. Additional stimulus was provided in the form of direct financial aid, or indirectly by taxation benefits.

The government set up two organs to provide, each in its own sphere, the technical assistance essential to enable our exploration ventures to develop in the degree expected of them.

The Institut Francais du Petrole was authorized, within the framework of a more general program, to ensure the supply of the technicians necessary to carry out a far-reaching exploration scheme, and also to promote scientific and technical studies conducive to enlarging and improving reconnaissance, exploratory and production techniques.

The Societe Nationale de Materiel pour la Recherche et l'Exploitation du Petrole (SNMAREP) was authorized to ensure the availability of exploration equipment by centralizing imports from America of drilling and research material, and by taking the necessary steps to promote their manufacture in France.

The State organ for supplying financial assistance was the Board of Petroleum Research—Bureau de Recherches de Petrole—set up by an Ordinance of Oct. 12, 1945, and commissioned to draw up and put into effect a national oil exploration program exclusively in the national interest. From the beginning this public body has been accorded a substantial government grant, and has accordingly been able—almost alone in the first few years after the war—to finance a certain number of limited companies in which it holds shares.

Encouraged by subsequent oil discoveries, private capital has been invested in exploration, for the State could not continue indefinitely to back all the ventures proposed and in being: $160 million for the first five-year plan (1946-1950), $320 million for the second five-year plan (1951-1955), and finally $715 million for the third five-year plan (1956-1960). Nearly a quarter of oil research investment is private capital, the proportion, negligible in 1945, having mounted steeply, particularly since exploration in the Sahara was started in 1953.

Although a heavy drain on the economy, these figures do not measure up to those for other countries, in particular the United States. But immediately after the war, with a considerably weakened economy, France was unable to provide the necessary financial aid. The sums essential for such a purpose were simply not forthcoming, even if public opinion had been more in favor of braving the risks of such an uncertain venture. The co-operation of international companies which were able to provide the necessary capital, "know-how" and technicians was therefore welcome.

In this way foreign groups such as Gulf, Shell and Jersey have played a part in oil exploration carried out in North Africa and Metropolitan France.

In addition, thanks to a wise financial policy, the French private assets position became healthier and capital was once again available. The State began to think it would be advisable to encourage investment in oil exploration by the capital available on the financial market. Two measures were therefore adopted simultaneously. One—based on the American precedent—is the depletion allowance. By law of Feb. 7, 1953, 50% of that amount of the profits reinvested in oil exploration is exempted from the tax on companies' profits, up to 27.5% of the gross proceeds from the sale of quantities produced. The second measure, contained in the law of Feb. 6, 1953, provides that the State should double any

(*Continued on page* 132)

*Part II*

# Progress in Reservoir Technology

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IN this, the second of a series of three articles reviewing progress in oil and gas reservoir technology, the writer discusses the properties of oil, gas and water as they exist under the pressure and temperature conditions prevailing in underground petroleum reservoirs. The first article, which appeared in the July issue of WORLD PETROLEUM, discussed the lithologic properties of oil and gas reservoir rocks. The third and concluding article of the series, discussing factors controlling drainage of petroleum from its reservoir rocks, will appear in an early issue of WORLD PETROLEUM.

*Distribution of fluids within the reservoir.* The fluids present in pertoleum reservoirs are liquid petroleum, natural gas and water, the percentages of each varying widely with the conditions governing migration and segregation during the period of accumulation and operation of earth forces during the subsequent period of storage. The pore spaces of the reservoir rock were originally filled with connate water, but a part of this was displaced when the reservoir was invaded by migrating oil and gas. The invading fluids found channels of least resistance through the more permeable portions of the reservoir, leaving the intervening less permeable portions still saturated with connate water. Subsequently, during long periods of geologic time, gravitational and capillary forces brought about further segregation of the three fluids.

Ultimately a condition of static equilibrium was reached, with the gas, oil and water accumulated in well defined zones within the reservoir, in accord with their respective densities. The free gas is concentrated in a "gas cap" in the crestal area of the structure. Below this is the zone of oil accumulation, and at still lower elevation, below an oil-water interface, much of the connate water originally saturating the pore space of the reservoir will be found. However, this concept of gravitational segregation of the reservoir fluids is usually modified somewhat by capillary forces. Fine-grained portions of the reservoir rock with comparatively small pore spaces, exert a greater capillary attraction on water than on oil. Hence, not all of the connate water will be displaced from the oil zone of the reservoir, the smaller pore spaces and remote recesses of the reservoir rock remaining water-saturated.

Interstratified lenses of shale and sandy shale containing considerable clay, are likely to remain water-wet, while the oil is concentrated in the surrounding coarse-grained sedimentary strata with larger pore openings and greater permeability. Thus, it is common to find a portion of the pore space within the zone of oil accumulation occupied by connate water: seldom less than 10 per cent of the pore space and sometimes 50 percent or more. Knowledge of this fact has compelled downward revision of oil reserve estimates of earlier years when it was assumed by many that the pore spaces of oil sands were completely saturated with oil. Water-wet areas within the oil reservoir also influence drainage conditions, as will be explained in the next article of this series.

The capillary attraction exerted by a porous medium for a liquid with which it is in contact, is directly proportional to the surface tension of the liquid and inversely proportional to the size of the pore openings. Water has a surface tension approximately twice that of crude petroleum. It follows therefore, that the smaller capillary openings of the reservoir rock, in contact with both oil and water, exert a selective action, tending to draw water into the rock pores, even to the extent of displacing oil that may have been initially present. Capillarity is a powerful, ever-present force in fine-grained rocks and in geologic time, by its selective action, may bring about fairly complete segregation of oil and water in the reservoir, the water ultimately occupying the fine-grained sediments having small pore spaces, while the oil is driven into communicating coarser grained rocks having larger pore openings.[9]

Whether or not this selective action of capillarity may proceed to the point where water is completely displaced from portions of the reservoir rock, so that the mineral surfaces become oil-wet rather than water-wet, is a matter upon which authorities are not fully agreed. Cores taken in the process of drilling through oil-bearing sands often appear to be oil-wet and seemingly certain little or no water, but some authorities contend that a thin film of water still clings to the mineral surfaces so that they are really water-wet rather than oil-wet. Others believe that a portion may become truly oil-wet and that such water as may still be present is confined to the more remote, smaller recesses of the pore spaces. In this connection, it must be remembered that the rock surfaces were originally water-wet and that if they are ever to become truly oil-wet, the intermolecular forces operative must favor displacement of water by oil. Whether the mineral surfaces of the reservoir rock are oil-wet or water-wet has an important influence upon the efficiency of drainage, as will be shown in the succeeding article of this series.[7]

Adhesion is an expression of an intermolecular attraction that exists between some liquids and solids. Both crude petroleum and water possess this property, and once in possession of a mineral surface will cling to it with great tenacity. A drop of oil placed on a smooth quartz surface, will spread until the oil film is so thin that it may no longer be distended without rupture. Grains of dry sand thus become completely enveloped in enclosing oil films. There is some evidence to indicate that liquids so retained on mineral surfaces by what we call "adhesion", are not mere surface films, but actually penetrate the surfaces to some extent and become "rooted" in the molecular structure of the mineral.

This adhesive force is theoretically an expression of interfacial tensions that exist between all liquids and solids in varying degree. Whether or not one of two immiscible liquids—such as oil and water—may replace the other on a mineral surface will depend upon the relative magnitudes of the solid-liquid and liquid-liquid interfacial tensions involved. By altering these interfacial forces, we may facilitate the replacement of one liquid by the other. Thus, alkaline substances that release free OH ions in water solutions will promote displacement of oil from siliceous mineral surfaces.

Apparently also, certain types of minerals have an absorptive effect on natural gases with which they are in intimate contact. This is illustrated by the action of finely divided silica gel, which has a selective action in absorbing and retaining lower molecular weight hydrocarbons in preference to higher molecular weight hydrocarbons. It is believed that secondary drusy siliceous coatings on mineral grain surfaces in reservoir rocks may possess this property in some degree and actually adsorb and retain some components of natural gas within their minute pore spaces.

*Temperature and pressure conditions within oil and gas reservoirs.* Both temperature and pressure normally increase directly with depth below the earth's surface, and in deep-seated reservoirs elevated temperatures and pressures may cause important changes in the physical properties of reservoir fluids in comparison with their more familiar properties that we observe under surface conditions.

The normal temperature gradient is

about one degree Fahrenheit for each 60-feet of depth below the surface, but in oil-bearing structures a somewhat more rapid temperature increase may be expected. Studies of ground temperatures in some oil fields have indicated geothermal gradients ranging from one degree for 25 feet of depth to one degree for each 50 feet. In any case, it is apparent that in most of the deeper oil and gas reservoirs (in excess of 10,000 ft.) temperatures of 200 to 400°F. may be expected: often considerably higher than the boiling point of water at sea level.

Subsurface pressures, which are usually an expression of the superimposed hydrostatic head in communicating formations, normally increase from 42 to 45 pounds per hundred feet below the prevailing water table of the locality. This is usually within a hundred feet or so of the surface. For example, the pressure may reach 4,000 pounds or more per square inch in a reservoir encountered at a depth of 10,000 feet below the surface. At such a pressure, any free gas that is trapped within the reservoir will be highly compressed; much gas will be held in solution in the oil; the physical properties of the oil will be altered; and the phase relationships of the oil and gas are modified.

*Phase relations in hydrocarbon systems.* It has been known, of course, for many years, that some of the hydrocarbons in nature's underground reservoirs occur in the form of liquids, others as gasses and vapors. But only within the past three decades has the complex behavior of these hydrocarbon mixtures been understood, particularly when subjected to high reservoir pressures and temperatures. At pressures of many huundreds of pounds per square inch and temperatures of several hundred degrees Fahrenheit, such as exist in deep-seated reservoirs, the hydrocarbons display physical properties quite unlike those that we observe under surface conditions. A notable research program, designed to explore this realm of knowledge has been underway at the California Institute of Technology since 1930, sponsored by the American Petroleum Institute. A book by B. H. Sage and W. N. Lacey,[11] the men who have guided this research, was published in 1939 and certain chemical technology journals and A.P.I. publications have printed a long series of technical papers dealing with various phases of this program.

Upwards of 90 percent of the natural gas associated with petroleum is methane. Except to the extent that it is dissolved in the reservoir liquids (oil and water), methane always occurs as a free gas in the reservoir. Ethane and certain higher molecular weight hydrocarbons may occur in the reservoir either as liquids or gases, depending upon pressure and temperature conditions. At very high reservoir pressures, the vapor density and viscosity of a hydrocarbon vapor may approach the density and viscosity of the same hydrocarbon in liquid form and it becomes difficult to distinguish, by their behavior, between vapors and liquids, Hydrocarbon gases and vapors under high reservoir pressures and temperatures, usually do not obey the physical laws governing pure gases in normal pressure and temperature ranges, so that important corrections must be applied to volume measurements at atmospheric pressure in estimating reservoir volumes.[3]

In multicomponent hydrocarbon systems with which we have to deal in petroleum reservoirs, partial pressure effects may play an important role. There is often a range of pressure and temperature reached in petroleum reservoirs, within which retrograde phenomena govern the behavior of the hydrocarbon gases and vapors.[13]

Normally, in single-component hydrocarbon systems, we expect increase in pressure beyond a certain point to bring about condensation in liquid form, while reduction in pressure ordinarily promotes vaporization from the liquid state. For some hydrocarbon mixtures within the retrograde range of pressure and temperature, these normal tendencies are reversed. Thus, it appears that certain hydrocarbon mixtures that are produced as liquids at the well head, are actually present as vapors in the reservoir from which they are produced.[14]

In addition to methane, other hydrocar-

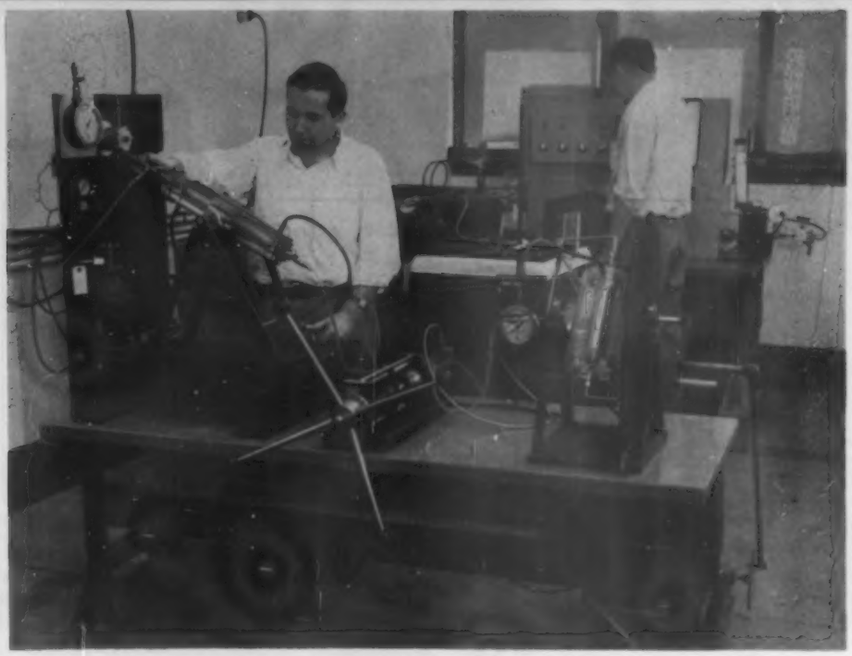


*Fig. 7. "P-V-T" apparatus, University of California Petroleum Laboratory.*

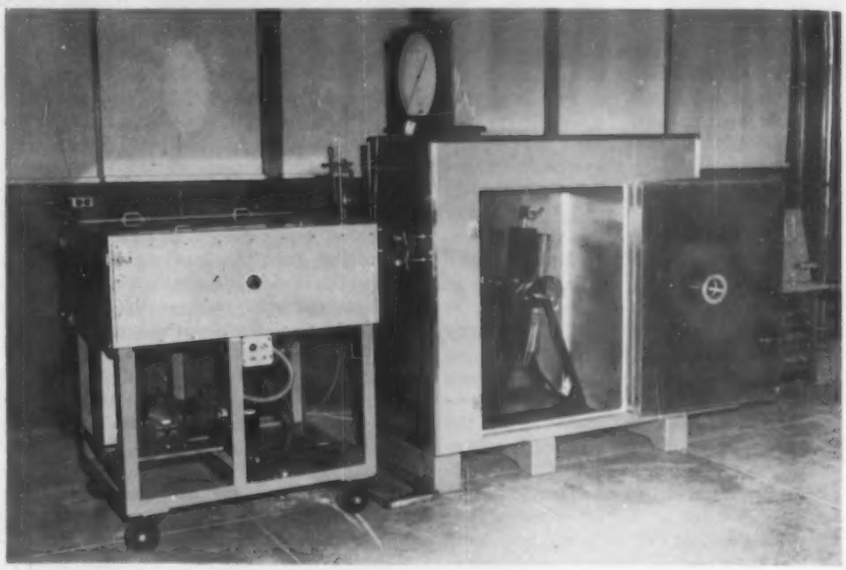


*Fig. 8. High pressure equilibrium cell and related equipment for studying phase relationships of hydrocarbons, University of California Petroleum Laboratory.*

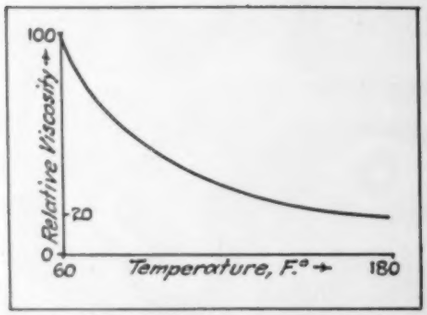



*Fig. 1. Influence of temperature on oil viscosity.*

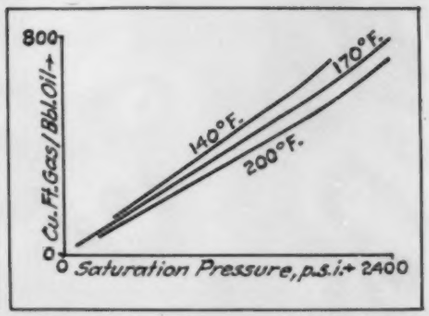



*Fig. 2. Influence of pressure and temperature on solution capacity of oil for n. gas.*

bons such as ethane, propane, butane and pentane are often present in the reservoir in the gaseous phase, though the latter three frequently occur as liquids at prevailing reservoir pressures and temperatures. They are readily condensable at moderate pressure and are the principal sources of commercial liquid petroleum gas and natural gasoline. Higher molecular weight hydrocarbons usually occur in the reservoir as liquid oils.

*Liquid hydrocarbons in the oil and gas reservoir.* Crude petroleum is a bewildering mixture of many different hydrocarbons, each having its own individual boiling point, density, viscosity and other physical properties. The physical properties of a particular crude petroleum are a result of the integration of properties of the many different individual hydrocarbons of which it is composed. For many years, the American Petroleum Institute and the U. S. Bureau of Mines have been supporting programs of fundamental research designed to identify and define the characteristics of the various hydrocarbons present in crude petroleum and the physical properties of crude oils from different fields. This work is still progressing. It is an interesting fact that no crude petroleum has yet been completely analyzed to identify all of the different individual hydrocarbons contained within it.

The physical properties of crude petroleums are influenced markedly by the high pressures and temperatures prevailing in deep-seated reservoirs. The relative viscosity of many crudes at temperatures of 200 to 300 deg. Fahrenheit is less than 20 percent of that at 60°F.[1] Density also diminishes with increased temperature. For example, an oil having a specific gravity of 0.90 at 60°F. may be expected to have a specific gravity of 0.80 at 350°F. Since oil is compressible to some extent, applied pressure increases its density, but the influence of high pressure on gas-free oil is comparatively slight in comparison with that of high temperature. However, natural gas is almost universally present in association with petroleum in nature's reservoirs, and application of pressure increases the solubility of natural gas in petroleum. And this may have an important influence on the properties of the oil.

An important forward step in our understanding of oil reservoir conditions occurred in 1926 with the appearance of publications by the U. S. Bureau of Mines[4] and the American Institute of Mining and Metallurgical Engineers,[2] giving the results of experimental tests on the solubility of natural gas in crude petroleum and on the influence of dissolved gas on the oil properties. It was then reported for the first time, that at pressures existing in oil and gas reservoirs, a barrel of crude petroleum can hold in solution many times its own volume of dissolved natural gas. Saturated with dissolved gas at reservoir pressure and temperature, it was also disclosed that petroleum in the reservoir is quite a different kind of liquid than we know it to be under surface conditions, having a much lower viscosity, lower surface tension and lower density; also, that the oil undergoes a considerable loss of volume on release of its dissolved gas. Knowledge of the solution capacity of petroleum for natural gas also provided a new explanation of the mechanism by which petroleum is expelled from the pore spaces of the reservoir rock.

In accord with well known physical laws governing solubility of gases in liquids, the amount of natural gas that may be held in solution in liquid petroleum increases directly with pressure. Thus, at 600 psi., when fully saturated, a barrel of a certain oil will hold in solution 200 cu. ft. of the associated natural gas; and at 2,400 psi. it will retain as much as 800 cu. ft. per barrel, or about 150 times the volume of the oil when measured under surface temperature and pressure conditions. At pressures as high as 5,000 psi., sometimes reached in deep-seated reservoirs, the solution capacity may reach 2,400 cu. ft. per barrel.

Increase in temperautre reduces the solution capacity of oil for natural gas, and the higher temperatures prevailing in deep-seated reservoirs tend to offset to some extent the increased solution capacity due to higher pressure. However, the influence of temperature on solution capacity is less pronounced than that of pressure. For example, an increase of 100 degrees in Fahrenheit temperature reduces the solution capacity by about 100 cu. ft. per barrel in some oils.

Liquid petroleum in underground reservoirs is not necessarily saturated with dissolved gas at the pressure existing. Indeed, petroleum in the reservoir is often undersaturated. Perhaps there is not enough gas in contact with the oil to reach complete saturation; or, the reservoir pressure may have increased after segregation of fluids and static equilibrium was reached when pressure in the reservoir was lower than we now find it. Diffusion of dissolved gas through the oil from a gas-oil interface in the reservoir, is exceedingly slow. Even geologic time might not achieve complete saturation of the underlying oil. The "saturation pressure" determines the "bubble point" or pressure at which the oil becomes saturated during depletion of the reservoir and begins to release its dissolved gas.

Knowledge of the fact that petroleum in the reservoir suffers a considerable loss of volume as a result of release of its dissolved gas, has required readjustment of established methods of estimating oil reserves.[3] Shrinkage in volume of the oil during depletion of the reservoir from a high initial pressure to atmospheric pressure, is as much as 36 per cent in some cases, often 20 percent or more. At the same time, the oil may lose several degrees in A.P.I. gravity—i.e., an increase in density Reservoir technologists make frequent use of the term "formation volume", which is applied to the volume occupied, when in equilibrium under reservoir conditions, by one cubic foot of the oil as produced and measured at the surface, together with the associated natural gas.

The surface tension of liquid petroleum is also materially reduced by dissolved gas. In one series of tests, it was determined that the surface tension of a certain crude petroleum was reduced about 84 percent by saturating it with dissolved gas at a pressure of about 1,600 psi. Surface tension is important in its influence on drainage of petroleum from its reservoir rocks,

*Fig. 3. Influence of dissolved gas on oil viscosity.*

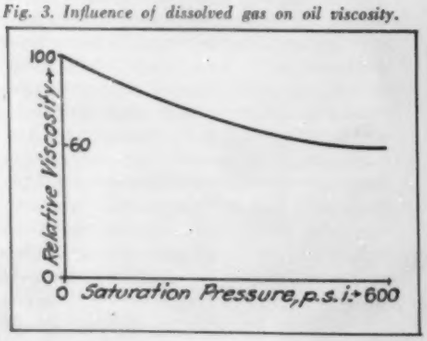
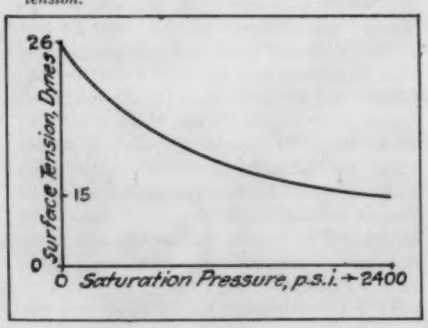



*Fig. 4. Influence of dissolved gas on oil surface tension.*



low surface tension tending to reduce frictional losses and adhesion of oil on the mineral grain surfaces.

*Water in oil and gas reservoirs.* As has been explained in an earlier section, water is always present to some extent in oil and gas reservoirs. Because of the powerful capillary attraction exerted by the fine-grained sediments on water, wells may produce very little water though it may occupy a considerable percentage of the pore space of the reservoir. This is usually connate water, trapped in the pores of the reservoir during the process of sedimentation and consolidation of the rock, not fully displaced during the period of oil and gas accumulation and retained during the subsequent period of storage.[12] It is usually highly saline, often containing from 10,000 to 200,000 parts per million of dissolved salts. Present-day sea water averages about 35,000 ppm of dissolved salts.

Water and oil are usually regarded as immiscible and tend to maintain their separate identities throughout geologic time. Actually, however, they are slightly soluble in each other and it is believed that this may have an important influence upon their interfacial tension relationships. The interfacial tension existing between water and oil in the reservoir determines to some extent, the efficiency with which edge water may displace petroleum from its reservoir rocks during the process of drainage.

Under the pressure and temperature conditions existing in oil and gas reservoirs, some of the water will ordinarily be vaporized and will be a part of the natural gas trapped at high points in the structure. Water often condenses from gas produced with petroleum from oil and gas reservoirs. Complex partial pressure effects, the pressure and temperature conditions, and the salinity of the water will determine how much water vapor may be present. Under the high pressure and temperature conditions prevailing in deep-seated reservoirs, the concentration of water vapor in natural gas produced from the wells may be as much as 0.6 bbl. per million cubic feet of dry gas.

Hydrocarbon gases are soluble in water, but much less so than in crude petroleum. As much as 20 cu. ft. of natural gas may be dissolved in a barrel of water at a pressure of 5,000 psi. and temperatures usually encountered at depths where such pressures exist. The solubility diminishes as the temperature and salt content of the water increases. On release of pressure in the process of depleting an oil and gas reservoir, the gas dissolved in the water is released from solution and becomes a part of the natural gas produced with the oil. Even the edge-water outside the productive oil limits of the reservoir may yield some gas to the ultimate production. Water is only slightly compressible, but the presence of dissolved gas may increase its compressibility by as much as 20 percent, and gas-saturated water undergoes some slight loss in volume as the dissolved gas is released from solution.

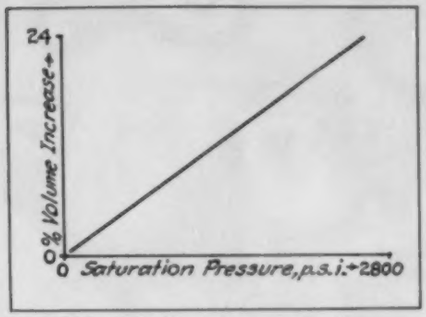



*Fig. 5. Influence of dissolved gas on oil volume.*

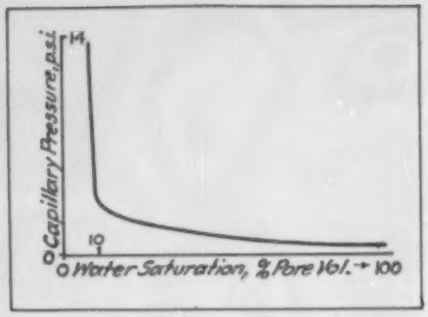



*Fig. 6. A capillary pressure curve.*

*Physical tests to determine properties and behavior of reservoir fluids.* Knowledge of the physical character and behavior of gas-oil mixtures under reservoir conditions has been gained by research techniques employing equipment specially designed to withstand the high pressures necessary while subjecting the fluids under test to temperatures comparable with those reached in deep-seated reservoirs. This research experience has been utilized in the development of simplified types of equipment now available from instrument manufacturers that is used in many oil company laboratories in routine tests on samples of reservoir fluids with the purpose of assembling critical data necessary in the solution of reservoir engineering problems.[5]

For observing the phase relationships of actual samples of reservoir fluids and determining their physical state and behavior under changing pressure and temperature conditions, equilibrium cells are used, constructed to withstand high pressures and to maintain desired temperatures in the fluids under test.[6] "P-V-T" (pressure-volume-temperature) apparatus of this character is expensive and must be operated by technicians especially trained in its use. Facilities are incorporated to quantitatively determine the volume and density of each component of the sample tested. The critical pressures and temperatures at which phase changes occur can be accurately determined. The solubility of gas in the oil under varying pressure and temperature conditions, the bubble-point, volume and density changes in the oil on release of dissolved gas, and the effects of dissolved gas upon the physical properties of the oil are thus determined. A high-pressure rolling-ball type of viscosimeter is also used in making tests of oil viscosity under reservoir conditions. Such information is helpful in estimating recoverable oil and gas reserves and in prescribing methods of well control for maximum efficiency in oil recovery.

For studying the effects of capillary forces on reservoir fluids, capillary-pressure tests are made.[10] Such tests yield results that are an index of the effects of pore size and configuration, the properties of the mineral surfaces and contained fluids on the capillary attraction exerted by the reservoir rock. Such tests may be employed in estimating the relative permeability of the rock to the wetting phase, the average size of pore openings, the interfacial and interstitial surface areas, the connate water content of the reservoir fluid and other lithologic properties. Capillary pressure apparatus must make provision for displacement of fluid from the pore spaces of a rock specimen by another nonmiscible fluid, through a porous and permeable barrier composed of material wetted by the displaced fluid, with facilities for varying the applied pressure and measuring the rate of fluid displacement. From the data secured, a capillary pressure graph is constructed, interpretation of which by one skilled in this technique, yields information helpful ot the reservoir technologist.

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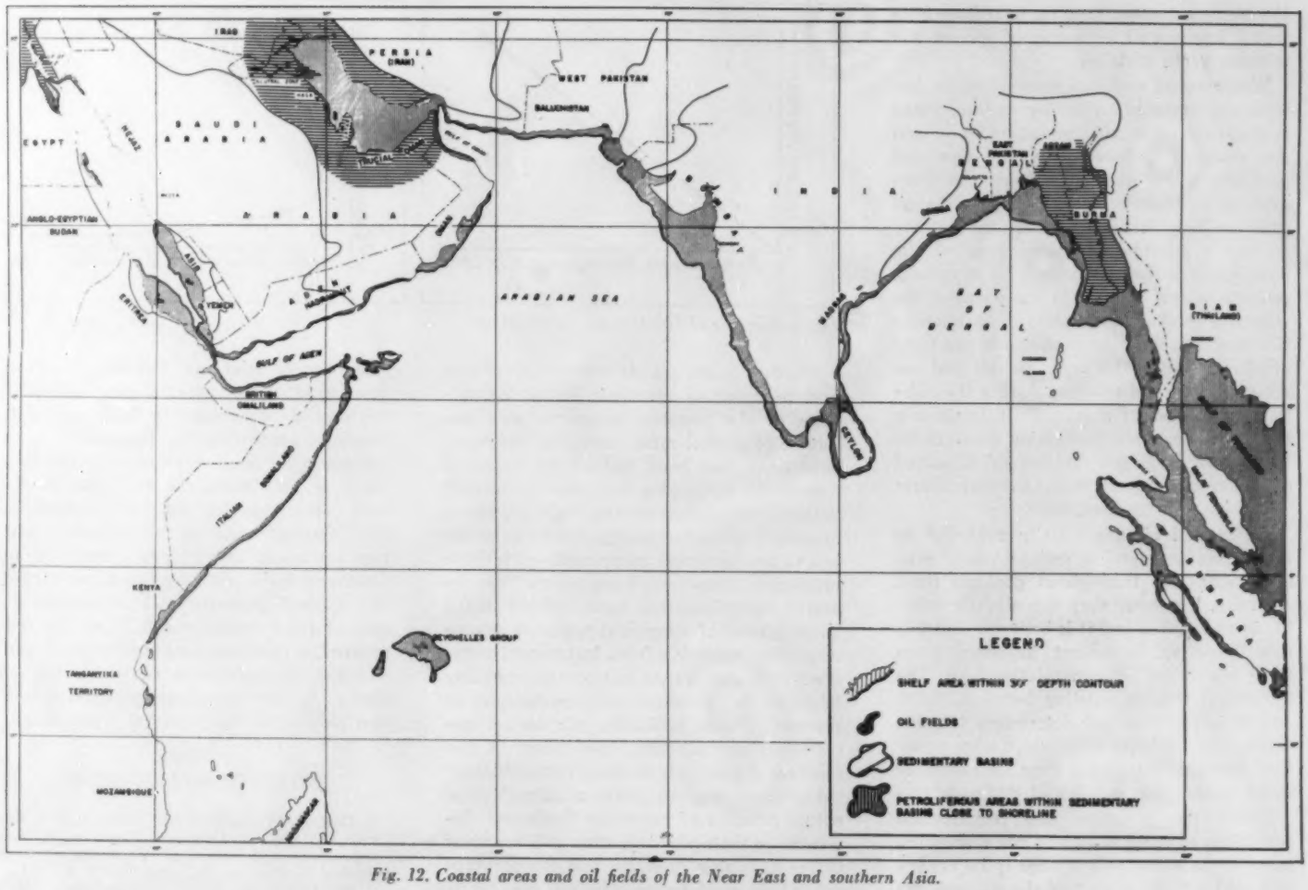


*Fig. 12. Coastal areas and oil fields of the Near East and southern Asia.*

## World Offshore Oil Provinces

(*Continued from page 78*)

raeli petroleum companies are, however, presently engaged in surveying the large unexplored areas on land and marine exploration off Israel lies in the future.

Sedimentary basins along the west coast of Africa are centered in French West Africa and in Nigeria and extend southward to Angola. A large sedimentary basin extends along the coast from north of Cape Blanco to Portuguese Guinea. This part of the coast is also distinguished by the presence of a wide expanse of continental shelf. Exploration is just beginning in this area.

More extensive exploration is being carried on in Nigeria. The continental shelf off this country is, however, with the exception of local areas, rather narrow.

The sedimentary basin along the coast of Angola appears to extend on the continental shelf, which reaches a maximum width of thirty miles south of Loanda. A recent discovery thirteen miles south of Loanda on land, lends increased interest to this area.

The first offshore oil field of the Middle East will go into full scale production this year. This is the Safaniya field situated on a Saudi Arabian concession in the Persian Gulf. The Persian Gulf and other Near East oil areas are shown on Fig. 12. The major part of the Persian Gulf does not exceed 150 feet in depth, and the maximum depth is 240 feet. A wide expanse of quite shallow water is situated on the southwest side of the Gulf adjacent to the prolific oil fields of Kuwait, the neutral Zone, Saudi Arabia and the island of Bahrain. Marine drilling was initiated off the Quatar peninsula last year and is being continued. The Persian Gulf area together with the Gulf of Mexica-Caribbean and the Indonesian areas will undoubtedly constitute one of the major marine oil provinces of the future.

Some of the countries bordering on the Indian Ocean, which also appear on Fig. 12, show oil possibilities on the continental shelves. This is especially true of West and East Pakistan and parts of India and Burma. The sedimentary basin of West Pakistan, which is known to be petroliferous, extends to the coast, where a continental shelf of appreciable width is located. Recent exploratory developments have indicated petroleum possibilities near the coast and possibly offshore.

A wide expanse of continental shelf is located off the coast of East Pakistan and Burma. This shallow sea area lies off the mouths of the Ganges, Brahmaputra and Irawaddy Rivers and the associated Tertiary sedimentary basin. Structural trends of the oil fields in Burma are aligned in a north-south direction. This is parallel to the long axis of the Tertiary basin which appears to continue to the edge of the continental shelf. Structural and stratigraphic conditions indicate good oil possibilities on continental shelf areas on both sides of the Bay of Bengal. Geophysical explorations are presently being considered in this area.

The East Indian archipelago in Indonesia contains, next to the West Indies, the greatest expanse of shallow seas in the world. Much of these continental shelf areas lie adjacent to petroleum production on shore. Prolific production in these areas comes chiefly from sediments accumulated in Tertiary idiogeosynclines forming an arc on the north side of Sumatra and Java and extending across Borneo. Fig 13 illustrates the general correlation of the sediments in these basins of accumulation. Most of the productive horizons lie, as indicated on the chart, in the Tertiary. It is only on the islands of Boeton and Timor, where oil was discovered in 1956, that petroliferous horizons are located in the Mesozoic.

The wide portion of the continental shelf in Indonesia begins in the Gulf of Bengal and entirely surrounds the Malayan Peninsula, encompassing the Gulf of Thailand and continuing to the northeast. The entire marine area between the islands of Sumatra, Java and Borneo lies within the 300 feet depth contour. This expanse of shallow water is illustrated on Fig. 14, which also shows the shallow Timor Sea and the Gulf of Carpenteria between New Guinea and Australia.

Offshore production may be expected in the very near future near the coast of Brunei in British North Borneo. Seven

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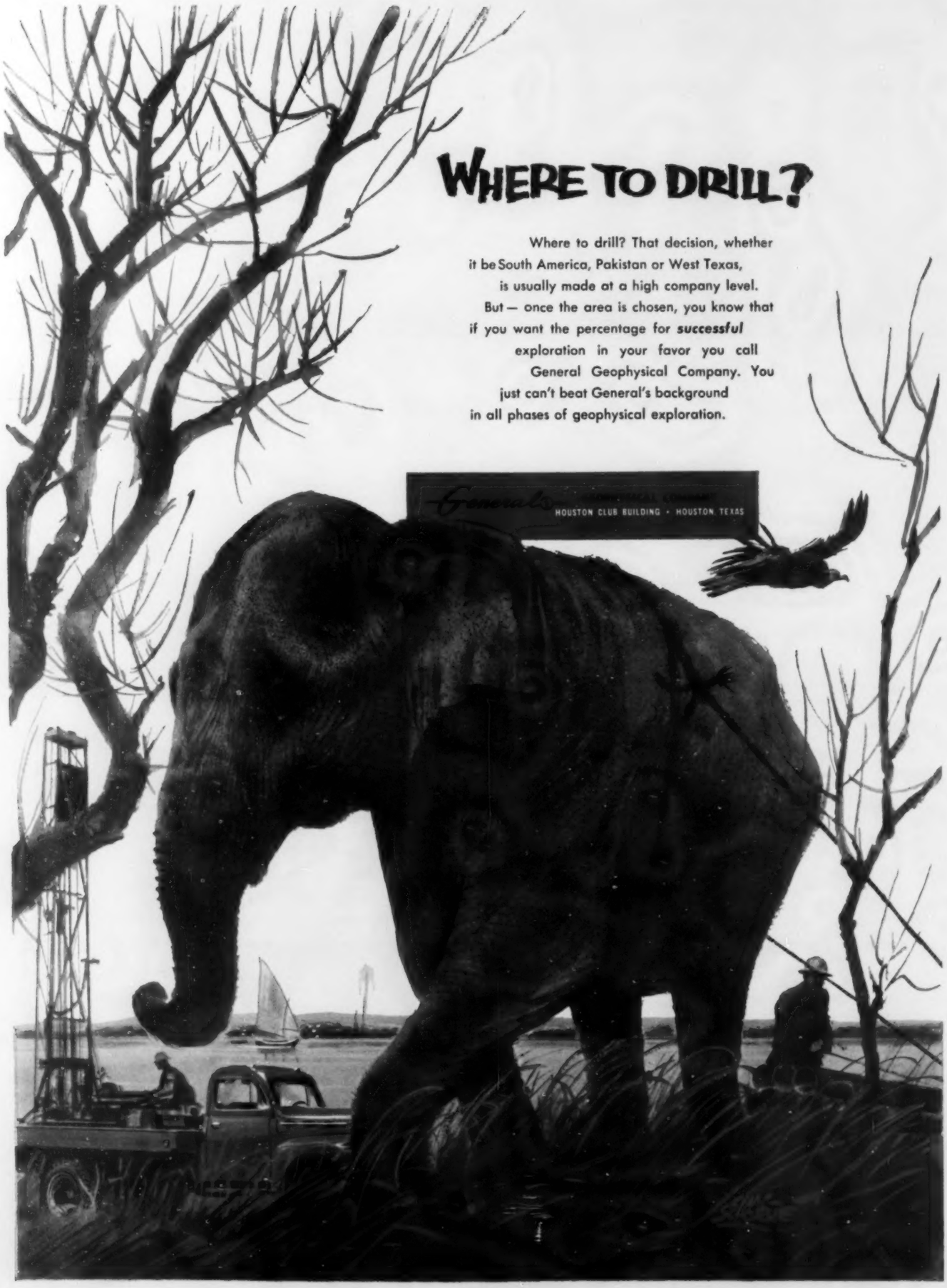
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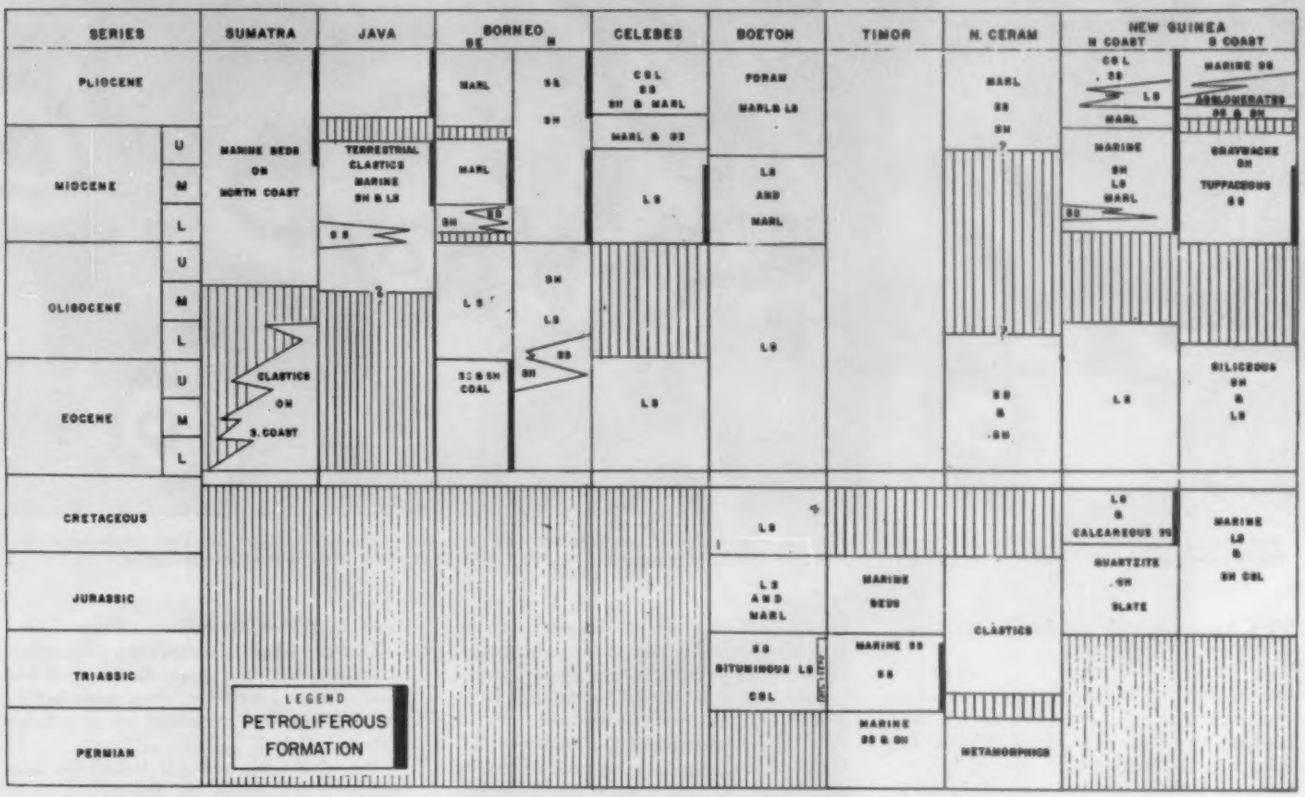


*Fig. 13. Correlation chart of petroliferous areas in Indonesia.*

marine drilling units are presently exploring the seaward extension of the Pliocene and Miocene clastics which form the producing horizons at the Seria field near the coast.

Many of the large oil fields of North Sumatra and Java lie in the immediate proximity of the shore, and marine exploration for petroleum appears to offer great potential in this area. The regional geology of the Java fields seems to be especially favorable for possible offshore production. This is due to the fact that all the sedimentary basins of both North Sumatra and Java are part of the same idiogeosyncline as the sedimentary basins on the southeast coast of Borneo. This suggests the possible continuation of the petroliferous horizons, and possible marine oil production across the entire Java Sea.

The shelf area near the northwest part of New Guinea, where oil production is known to occur, is rather limited. The same is true for the north coast where deep water lies almost immediately adjacent to the shore line. A large expanse of shallow water lies adjacent to a sedimentary basin on the south and southwest coast of New Guinea. The oil possibilities of this basin have, however, not yet been sufficiently tested.

Marine oil possibilities are present along the coast of western Australia. A wide expanse of continental shelf extends along the coast in the vicinity of the sedimentary basins in northwestern Australia. This sedimentary basin is presently being explored, but results have so far been inconclusive. There is some evidence that this, the Fitzroy or Desert basin, continues on the continental shelf and deepens in that direction. The Rough Range oil discovery in western Australia is adjacent to the sea in a sedimentary basin which may continue under the shelf. This possibility is presently being tested by Western Australian Petroleum PTY, Ltd. The company is also conducting investigations in the Shark Bay area, two-hundred-fifty miles to the south of the original Australian oil discovery at Rough Range. The stratigraphy of the mountains surrounding the Western Australian basins shows a thin Mesozoic and Tertiary section and a considerable thickness of Paleozoic strata. The general position and structure of both the Desert Basin on the northwest coast, and the North West Basin on the west coast suggest the possibility that the Tertiary sediments may thicken under the continental shelf. This possibility is partially confirmed by some of the deep tests drilled. The Cape Range test, which was drilled to a total depth of 15,188 feet in the Desert Basin, encountered the Jurassic at a depth of 10,098 feet.

The exploration program at Shark Bay, in the northwest basin is presently being carried on by core drilling on Dirk Hartog's Island and on the adjacent mainland. An expanse of shallow water over seventy miles wide lies between the two areas, and the geomorphology of the region suggests the existence of a northward-plunging depositional basin between the island and the mainland. Results of the preliminary work are not available but it is believed possible that this may become a marine oil province.

In summing up the results of this study it seems desirable to point out that:

1—Modern exploration techniques including concentrated use of geophysics are being applied with a great deal of success to the location and development of marine oil resources in the Gulf of Mexico. This success has focussed attention on other possible marine oil provinces of the world.

2—Past experience has indicated that in some less advanced countries, where communication roads and settlements are few and widely spaced, the cost of offshore development is lower than that on land.

3—It has been shown that unit seismic exploration costs in marine areas are approximately one third of those on land.

Because of these factors, the next decade may be expected to show a marked increase in exploration and development of offshore oil provinces throughout the world. Focal points for this expansion of the oil industry to sea may be expected to lie in the following areas:

(a) The Gulf of Mexico
(b) The Caribbean coasts of Central and South America and the Cuban area
(c) The coasts of Ecuador and Peru
(d) The Mediterranean coast of Africa
(e) The Persian Gulf
(f) The large marine areas of the East Indian Archipelago

As development progresses in some of these zones, other areas will receive attention, and new techniques in geology, geophysics and oceanography will tend to push the present limits of exploration further out to sea.

The oil industry has taken up the challenge of oil under the seas of the world and is making a success of the venture. END

*Auto racing is a "boom" sport in Australia at present and crowds of up to 100,000 gather to watch the speed cars in action. These light cars were competing at Melbourne's 3-mile Albert Park circuit where topline drivers and their vehicles will compete this year in events to be staged at the time of Olympic games.*

## The Australian Petroleum Market

(*Continued from page* 101)

(in the Port of Melbourne gross tonnage passing through the port has risen from 7,394,821 tons in 1946 to 16,432,793 tons in 1955) and by the fact that more ships are using oil rather than coal as fuel. In 1946 only 74% of overseas ships calling at the Port of Melbourne were oil-burning. Today 99% use oil.

The prevailing import restrictions may lessen shipping tonnage in Australian ports temporarily, but the upward trend in shipping tonnage is expected to be maintained.

The use of oil as fuel by Australian railways has increased greatly since 1946. In that year approximately 1,500,000 gallons of oil was used by the railways. In 1953-4 28,734,000 gallons of diesel and distillate were used and 30,020,000 gallons of fuel oil in steam trains. Diesel locomotives are proving admirable for Australian conditions, saving both time and money, and it is predicted that they will eventually completely replace steam locomotives.

A large proportion of the increased distillate consumption is being used as fuel by diesel buses and trucks which have become increasingly popular. From 1952 to 1955, 33.4% of new omnibuses registered and 4.8% of trucks were diesel vehicles. It is estimated that in 1954-5, 49,250,000 gallons of distillate were used as fuel for trucks and buses. The number of tractors in Australia increased from 60,000 to 170,000 between 1945 and 1954 and a large proportion of these run on distillate or diesel oil.

The use of black oils for heat raising for industry has also increased greatly since 1946. In that year, 37 million gallons was used, in 1953-4, 119 million gallons.

This use of oil is widespread throughout industry. Refineries themselves use oil and iron and steel smelters, glass manufacturers, bakeries and breweries are also large users of oil fuel.

The electricity and gas industries both now rely heavily on oil. The use of oil in electricity undertakings has grown from 13½ million gallons in 1947 to 76½ million gallons in 1955. In the gas industry it has grown from six million to 18½ million tons from 1945 to 1955.

*Future Developments*—The increasing use of distillate for transport coupled with the vast construction projects, such as the Snowy Mountain Scheme and the development of uranium fields in Australia for which diesel-powered earth moving equipment will be used, will mean a substantial increase in distillate consumption.

**TABLE VII**

**DISTILLATE**

| Year | Consumption ('000 Imp. Gals) | Percentage Change | Refinery Production ('000 Imp. Gals) | Production as Percentage of Consumption |
|---|---|---|---|---|
| 1946 | 21,963 | | 464 | 2 |
| 1947 | 28,868 | +31 | 2,835 | 10 |
| 1948 | 38,505 | +33 | 1,199 | 3 |
| 1949 | 47,955 | +25 | 3,059 | 6 |
| 1950 | 60,788 | +27 | 11,428 | 19 |
| 1951 | 88,325 | +45 | 9,720 | 11 |
| 1952 | 89,062 | + 0.8 | 8,995 | 10 |
| 1953 | 94,457 | + 6 | 8,589 | 9 |
| 1954 | 104,923 | +11 | 15,914 | 15 |
| 1955 | 122,723 | +17 | 76,040 | 62 |
| 1956 | 140,000 | +14 | | |

**DIESEL OIL**

| | | | | |
|---|---|---|---|---|
| 1946 | 130,686 | | 5,837 | 4 |
| 1947 | 156,168 | +20 | 1,259 | 0.8 |
| 1948 | 160,516 | + 3 | 8,263 | 5 |
| 1949 | 199,060 | +24 | 18,964 | 10 |
| 1950 | 184,693 | + 8 | 26,233 | 14 |
| 1951 | 209,545 | +14 | 29,962 | 14 |
| 1952 | 192,144 | — 9 | 28,100 | 15 |
| 1953 | 190,998 | — 0.6 | 30,982 | 16 |
| 1954 | 212,185 | +11 | 82,193 | 39 |
| 1955 | 225,054 | + 6 | 164,087 | 73 |
| 1956 | 200,000 | —13 | | |

**TABLE VIII**

**FUEL OIL**

| Year | Consumption ('000 Imp. Gals) | Percentage Change | Refinery Production ('000 Imp. Gals) | Production as Percentage of Consumption |
|---|---|---|---|---|
| 1946 | 86,816 | | 22,519 | 26 |
| 1947 | 88,272 | + 2 | 44,129 | 50 |
| 1948 | 141,373 | +60 | 34,549 | 24 |
| 1949 | 203,906 | +44 | 43,982 | 22 |
| 1950 | 251,436 | +23 | 56,199 | 23 |
| 1951 | 310,870 | +24 | 77,593 | 25 |
| 1952 | 277,458 | —12 | 86,156 | 25 |
| 1953 | 260,944 | — 6 | 85,420 | 33 |
| 1954 | 314,636 | +21 | 137,732 | 44 |
| 1955 | 474,642 | +51 | 514,471 | 108 |
| 1956 | 500,000 | + 5 | | |

**TABLE IX**

**BUNKERS—('000 IMP. GALLONS)**

| Year | Distillate | Percentage Change | Diesel Oil | Imp. Percentage Change | Fuel Oil | Percentage Change |
|---|---|---|---|---|---|---|
| 1946 | 1,900 | | 33,018 | | 85,811 | |
| 1955 | 957 | —98 | 57,010 | +73 | 183,761 | +114 |

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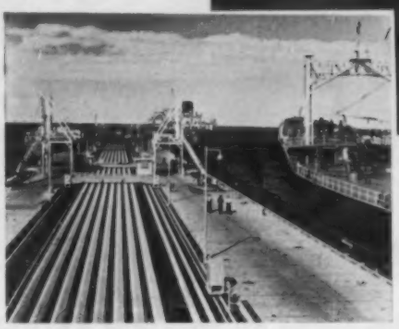

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With particular regard to diesel oil, it is estimated that the consumption during 1956 will be below the 1954 and 1955 figures. This is due to the fact that because of the greater economy of fuel oil—in spite of the higher initial capital cost for burning and storage equipment—many users of diesel oil have already switched from diesel oil to fuel oil and will continue to do so.

Another factor is that modern vessels are using increasing quantities of fuel oil where previously diesel fuel has been used. When forecasting a consumption, one must take into consideration, various developments and it is not beyond the realm of possibility that during the next few years. diesel fuel consumption may rise as it may partly replace distillate at present used, for instance, by railways. Recently tests have been successfully carried out in the United States which prove that under certain conditions "residual oil" such as diesel fuel and fuel oil can be successfully used in diesel electric locomotives.

*Petroleum powered tractors and other mechanical aids help Queensland sugar farmers in the back breaking task of bringing in the fire blackened cane.*

Considering the trend of consumption of fuel oil, it is obvious that the use of fuel oil is intimately connected with increased power requirements in the Commonwealth. Consumption during the first three months of 1956 shows that by the end of the year, over 500 million gallons of fuel oil will be required both within the Australian economy and for bunkering purposes. There is very little doubt that this trend will continue over the years to come.

While for the years 1946 to 1955, refinery production has been stated for distillate, diesel fuel and fuel oil and the production as percentage of consumption has also been given, it must be borne in mind that the refinery and production pattern has changed considerably. Modern refining methods permit a good deal of adjustment of the products produced in relation to actual requirements.

For instance, some refineries produce diesel fuel by a process which could perhaps be best but inadequately described as a blending between distillate and diesel fuel. Again, if and when requirements for motor gasoline rise, the original distillate obtained by "distillation method" could partly be converted into motor gasoline by the process of catalytic cracking. It would therefore seem to be advisable to estimate refinery production during 1956 on the basis of the three products under discussion combined rather than relating to the individual products.

Total refinery production in Australia during the year 1956 is estimated to be in the vicinity of 2,082 million gallons. Roughly speaking, refinery production consists of one-third each of "light fractions" (motor gasoline, solvents, etc.), one-third of "medium fractions" (from which distillate is produced) and one-third of "residual oils" (diesel fuel and fuel oil).

Refinery production in 1956 is estimated to produce 1,115 million gallons of those "fractions" from which distillate, fuel oil and diesel fuel are produced. As the total consumption of the three products during 1956 is estimated to be in the vicinity of 840 million gallons, it can be stated with assurance that the Australian refining industry will be in a position to satisfy Australia's total demand for these products.

This is a vast step forward and a most important factor in the Australian economy, by reason of the tremendous savings resulting in foreign exchange payments. There are, of course, other very important aspects to be considered such as the strengthening of the nation's strategic and defense supply positions.

As it has been said previously, modern refining methods permit a great degree of flexibility and this flexibility will take care, to some extent, of the difference between the estimated total consumption of the three products of 840 million gallons as compared with the estimated refinery production of one billion gallons. Apart from this, it must be borne in mind that the refineries are already exporting a part of their production to New Zealand, South Africa, Singapore and many other places.

While it is difficult to forecast the position of 1957 and 1958, it can confidently be stated that the Australian refineries will be able to take care of a vastly increased demand due to their flexibility and the fact that really none of the existing refineries are operating today to the fullest of their capacity. In other words, provisions were made when the refineries were built to take care of expansion. The foreseeable future of the Australian petroleum market makes the need for such expansion an eventual certainty. END

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## All Time High in World Drilling

*(Continued from page 83)*

company owned by the same interests as IMOC, is doing exploration work jointly with Israel Mediterranean Petroleum and is currently engaged in drilling carried on by the Tri-Continent Drilling Co. in the Negev area.

In Syria the J. Menhall Drilling Co. of Benton, Ill., received exploration rights over extensive tracts during 1955, and enlisted the financial support of a syndicate in the U.S. headed by Cyrus S. Eaton, chairman of the Chesapeake and Ohio Railroad, according to reports.

In neighboring Lebanon a local firm, the Cie Libanaise des Petroles, received an exploratory concession. This is not the same company as Lebanon Petroleum Co., a subsidiary of Iraq Petroleum Co. which also carried out exploratory drilling in Lebanon some years ago. Pacific Western Oil Co. (now Getty Oil Co.) formerly held an interest in a Lebanese concession, covering some 700,000 acres.

In Jordan, an American oil man, Edwin W. Pauley, of Los Angeles, obtained an exploration concession early this year covering the entire country. He plans to begin drilling soon. According to reports a concession agreement is also being requested by Jorge Zimeri, described as an industrial magnate from Guatemala. Since the Pauley concession covers the entire country until October at which time he is to select one-third of the country for more exploration, the Zimeri concession will presumably have to wait until that time.

Another newcomer to the Middle East is the Yemen Development Corp., a U.S. group which is under the chairmanship of George Allen. The company obtained exploration rights in 1955 to about 40,000 square miles, forming the northern two-thirds of the country. One of the principal stockholders in this company is reported to be Oil and Gas Property Management Co., Dallas, Texas.

Egypt's new petroleum law, which was passed in 1953, attracted one of the outstanding independent explorers, the Conorada Petroleum Corp. This is an operating subsidiary of three established U.S. companies, Continental, Amerada and Ohio Oil. It obtained a large concession over the Western Desert region of Egypt in 1954. Later two other U.S. companies, Cities Service Co., which also has a concession over the Dhofar region of Muscat and Oman, and Richfield Oil Corp., obtained an adjoining area and the companies pooled operations. The operating company for this area is the Sahara Petroleum Co., now running several rigs in Egypt.

National Petroleum Co. of Egypt, S.A.E. applied for 48 prospecting areas on both sides of the Gulf of Suez in 1950, but did little or no exploration work until 1953, when it was activated as an operating company for the International Egyptian Oil Co. The latter was created on March 15, 1952 with capital contributed by the Southern California Petroleum Co., the Blair Interests and a group of Swiss bankers associated with the Hoffman Bank of Zurich. Later, the Italian government agency, Azienda Generale Italian Petroli (AGIP) and the Belgian Compagnie Financiere Belge des Petroles, S.A. (Petrofina) acquired shares in this company. The American Southern California Petroleum Co. became operator for the company and had a share of production until recently.

In 1955 there was created a new exploration company, Compagnie Orientale des Petroles, which is an IEOC subsidiary, with minority stock (20%) held by the Egyptian Societe Cooperative des Petroles. It was established for the purpose of exploring the areas held by IEOC. Recently, an Egypt Texas Oil Corp. or Egypt Oil and Gas Corp. was reported created, with capital owned jointly by the City Investing Co., Inc. of New York, and the Knickerbocker Investing Corp. The company intends to apply for exploration licenses in Egypt. The West Germans are represented in Egypt through the Gewerkschaft Vereinigte Borgholzhausen and by the recently founded Egyptian-German Petroleum Co. Egyptians joined the picture by applying for concessions through El Tahrer Petroleum.

Following passage of the 1953 law, the government granted Conorada's concession and then halted action on the majority of remaining applications. In March, 1956 an amendment to the oil law permitted applicants to offer special advantages to the nation, and applications were filed in April 1956 by Tidewater Oil Co., Ralph E. Fair, Inc., of San Antonio, Texas, Marcel Wagner (for Near East Associates), Egyptian Oil and Gas Corp., African Oilfields, Ltd., Cooperative Petroleum Society of Egypt, International Egyptian, Sahara Petroleum Co., Shell Oil, and Mobil Oil of Egypt. These applications have not yet been granted and are dependent on the various advantages offered by the applying companies. Another U. S. independent company, the General American Oil Co., Texas, has recently joined the list of applicants.

None of the independent companies is exploring in French North Africa and the only major company, Shell, recently abandoned its Tunisian effort although it retains an interest in CREPS, an Algerian company.

Several independents are involved in the recently-begun search in Libya and one, Texas Gulf Producing Co., is drilling a well at present. Operating subsidiary for the company is the Libyan American Oil Co., which holds extensive concessions in the country. W. R. Grace & Co. made what is believed to be its first entry into foreign oil exploration by purchase of 49% in Libyan American and will advance around $7.5 million for exploration expenses. Amerada Petroleum Co. of Libya is also represented, as is Continental through its subsidiary, Continental Oil Co. of Libya. Standard Oil Co. (Ohio) also received concessions through its subsidiary, Oasis Oil Co. Bunker Hunt Oil Co., a Texas company, also obtained exploration rights.

Elsewhere in Africa Petrofina is continuing its search and development of its find in Angola. In Italian Somaliland (Somalia) the Sinclair Somal Corp. is drilling a well No. 1 Gira, on a concession in which 50% interest is held by Sinclair Somal and 50% divided between Continental, Amerada and Ohio Oil. Sinclair is also exploring in Ethiopia.

Standard-Vacuum is exploring two concessions in British Somaliland obtained from an independent company from Los Angeles, the Moriqui Exploration Co., which recently took out other licenses in the country, only to surrender them later.

In the Far East and Australasia independents are represented in Pakistan, Australia, New Zealand, and the Philippines.

In Pakistan, the Nelson Bunker Hunt interests, Dallas, obtained exploratory rights over about 20,000 square miles and spudded an exploratory well recently.

Australia has seen the creation of many new companies since the strike during 1953 by West Australian Pty. Ltd., owned by Caltex and Ampol, a local company. The companies formed by local Australian capital are almost too numerous to list. In Western Australia they included Abo Gold Exploration and Flotations Ltd., Goldfields Petroleum Discovery Syndicate Ltd., Atom Minerals and Oil Ltd., West Coast Oilfields Ltd., Northwest Oil Pty., Ltd., Kimberly Oil Syndicate, Gulf Oil Syndicate, and Associated Freney Oil Fields. Some of those in Victoria are Gippsland Oil Co., G. D. Lindholm, Mineral Ventures N.L., Mineral Quet, Woodside (Lakes Entrance) Oil Co., and others, including such large company combines as Frome Broken Hill which is owned by British Petroleum, Standard Vacuum, Consolidated Zinc Corp. and Interstate Oil Co., both the latter local concerns. In Queensland, on the opposite side of Australia there are also numerous small companies operating, of which at least two are American, the Longreach Oil Co. and the Lucky Strike Drilling Co. Both the latter companies drilled wells during 1955 without success.

The Philippines have recently granted concessions to a number of American concerns. These include major companies (Caltex and Standard Vacuum) but there are several local companies represented as well. A local company, Philippine Oil Development Co. (Phodco) is drilling an exploratory well in the Cagayan Valley of Luzon Island. An independent American company, the San Jose Oil Co. recently received concessions. The company is owned by Pantepec Oil Co. and Pancoastal Petroleum Co., both of which are controlled by the J. W. Buckley interests of New York. Three other companies, Acoje Mining, Luzon Stevedoring and Philex Mining Corp. are all owned by local capital. Another American company, the White Eagle Overseas Co., a subsidiary of White Eagle Oil, Tulsa, has recently been given concessions, according to press reports. END

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# New Publications

PETROLEUM INDUSTRY—1955, by Frederick G. Coqueron Petroleum Analyst, Chase Manhattan Bank. An annual review of the world petroleum industry and of 34 oil companies. Among the highlights of the study are the following:

Free World demand for petroleum products rose 10.6% in 1955, with demand in the United States increasing 8.4% and in other countries 13.8%. This was matched by an increase in crude production of 11.7% over 1954, averaging 13.7 million barrels daily during 1955. Refinery throughput also increased, rising to 13.5 million barrels daily during 1955 for an increase of 10.7% over the previous year. Crude reserves increased to 180 billion barrels, of which 69.4% was located in the Middle East.

Matching the increase in world demand and production, earnings and dividend payments of American oil companies increased substantially during the year based on the 34 oil companies reviewed. Capital expenditures by the industry rose to $8.2 billion, of which 60% was for crude production and 40% for other facilities. Gross investments in fixed assets by Free World petroleum companies amounted to approximately $63 billion at the end of 1955.

The study is available through the Chase Manhattan Bank, Petroleum Department.

PETROLEUM PRODUCTION ENGINEERING, by Lester Charles Uren. McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, N. Y. $12.00.

This is the fourth edition, newly revised in this issue, of Dr. Uren's study of technology of engineering problems involved in development of oil and gas fields, especially drilling methods and equipment. This volume is one of the series of three. The other two covers other phases of oil technology.

ATOMIC ENERGY, by the Academy of Sciences of the USSR. Available through Associated Technical Services, P.O. Box 271, East Orange, N. J. Annual subscription $85.00. Reviews of latest developments in peaceful uses of atomic energy, published six times per year, in English.

ANNUAL REVIEW OF GASOLINE QUALITY—1955, by Ethyl Corp., 100 Park Avenue, New York, N. Y.

This is the first annual issue summarizing Ethyl's monthly reports on changes in octane ratings in the United States. It is considerably enlarged and includes year end research octane numbers in 23 other countries, in addition to sales and other data.

ASTM STANDARDS ON PETROLEUM PRODUCTS AND LUBRICANTS FOR 1955. Published by the American Society for Testing Materials, 1915 Race Street, Phila. 3, Pa. Cloth $7.50.

This edition (November 1955) of the ASTM methods for testing petroleum products has grown to 984 pages and includes 159 standards, 41 of which are new or revised since the previous edition. Included are two new Tentative Methods of Test for Lubricating Qualities of Graphites (D 1367) and Trace Concentrations of Tetraethyllead in Primary Reference Fuels (D 1368). New Standard Methods of Test are included for Aromatic Hydrocarbons in Olefin-Free Gasolines (D 936), Oxygen in Butadiene Vapors (D 1021), Effect of Grease on Copper (D 1261), Lead in New and Used Greases (D 1262), Sampling Liquified Petroleum Gases (D 1265), Unsaturated Light Hydrocarbons (D 1268) and several others.

API PUBLICATIONS FOR OIL MARKETERS, by the Marketing Division of the American Petroleum Institute, 50 West 50th Street, New York 20, N. Y. A catalog of 24 API publications for oil marketers. Major sections of the catalog are on management, training, marketing research, stock loss control, lubrication, accounting, driver training, management institutes, marketing safety aviation and advertising. Copies of the folder are available free of charge from the Marketing Division, American Petroleum Institute at the above address.

API STD 6D, 7TH EDITION, FEB. 1956, by the Production Division of the American Petroleum Institute, 300 Corrigan Tower Building, Dallas, Texas. Price 50 cents.

A specification covering steel gate, plug, and check valves for pipeline service. This 7th Edition is a revision of a previous edition dated May 1949 and reflects current requirements on pipe line valves including sizes up to 30-inch diameter. Copies may be obtained from the Division of Production, at the above address.

GUIDE DU PETROLE. Olivier Lesourd, 252 Faubourg Saint-Honoré, Paris, France. 6,000 francs (about $17).

A two-volume work including (1) French petroleum laws as revised, industry data including refining, imports, customs regulations, prices of products, etc.; (2) Yearbook of French petroleum, including reports on professional agencies, refining, producing, importing and other companies; warehouses for petroleum distribution and agencies, petrochemicals in France, financial information on major companies and a director of equipment suppliers. A listing of telephone numbers for the various companies is contained. Forward by Mr. Jean Blancard, Fuels Director for the French Government. A very useful work, consolidating much needed information on France. In French.

ASTM STANDARDS—Fuels, Petroleum Aromatic Hydrocarbons and Engine Antifreezes. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. $11.00.

A triennial publication containing standard specifications, tests and definitions for the petroleum industry of 1,496 pages.

ZEITSCHRIFTEN KATALOG 1955/1956. Buch-und Zeitschriften-Union, Postfach 907, Hamburg 1, Germany.

A listing of German periodicals. Will be supplemented on May 1956 by another catalog listing about 1,500-2,000 foreign scientific and technical periodicals. Index in English, German and Spanish.

## Industry Brochures

SHAFER SELF ALIGNING ROLLER BEARINGS, a brochure by the Chain Belt Co., Milwaukee 1, Wisconsin. A 72-page brochure describing Chain Belts roller bearings.

THE DE LONG DOCK, a booklet by De Long Corp., 29 Broadway, New York 6, New York. A 20-page booklet on De Long Jacks and De Long technique of dock construction, of which the famous Texas Tower is one application. Other illustrated De Long installations include drilling platforms, piers and wharves. Direct requests for this booklet to Mrs. Dorothy Duffy at De Long Corp., 29 Broadway.

TECHNICAL BULLETIN No. 88, a bulletin by Charles Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn 6, N. Y. This is a report on the use of citric and gluconic acids to maintain input capacity of water flood injection wells. Function of the acids is to prevent precipitation of insoluble iron salts in the presence of other metallic ions such as calcium and magnesium.

SUMMARY SECONDARY RECOVERY OPERATIONS IN KANSAS DURING 1954, by The Interstate Oil Compact Commission, Box 3217, Oklahoma City 5, Okla. A reprint from Bulletin 112 of the State Geological Survey of Kansas. It lists 172 secondary recovery projects which produced more than 10 million barrels in 1954. Copies may be obtained from the Interstate Oil Compact Commission at the above address.

WASTE TREATMENT, Bulletin 70-B, by Infilco Inc., Tucson, Ariz. This bulletin describes methods of treating effluent waters from oil refineries.

ETHERS AND OXIDES, by Carbide and Carbon Chemicals Co., 30 East 42nd Street, New York 17, New York. Discusses applications of 32 products, including ethylene oxide and propylene oxide. Gives data on physical properties, solubilities, etc. Contains list of new literature.

HEAT EXCHANGER BULLETIN 1401, a bulletin by The Griscom-Russell Company, a subsidiary of General Precision Equipment Corp., Massillon, Ohio. The bulletin explains in detail the design of the G-R Twin G-Fin Section of a many purpose heat exchanger.

ENGINEERING FOR THE PROCESS INDUSTRIES, by W. J. Fraser & Co., Ltd., Harold Hill, Romford, Essex, England. A description of the Fraser company's design manufacture and constrution of plant and installations for the petroleum and other industries.

KWINANA—A "KELLOGGRAM," by The M. W. Kellogg Co., 225 Broadway, New York 7, New York. Describes early planning, scheduled procurement and design of the large Kwinana refinery in Western Australia.

ETHANOLAMINE DATA BOOK. Allied Chemical & Dye Corp., Nitrogen Division, 40 Rector St., New York. A 54-page technical data book describing ethanolamines, monoethanolamine, diethanolamine and triethanolamine, listing their applications, chemical and physical properties, physiological properties, shipping specifications, handling and storage features, and gives a comprehensive bibliography.

HOUDRY PIONEER—Four Ways to 100 Octane, by Dr. Heinz Heinemann. Houdry Process Corp., 1528 Walnut Street, Philadelphia, Pa. This bulletin describes the four methods which are (1) single-stage Houdriforming with periodic catalyst regeneration, and Iso-Plus processing schemes supplementing continuous, mild, non-regenerative Houdriforming with (2) separate Houdriforming of paraffinic raffinate, or (3) recycling of paraffinic raffinate, or (4) thermal reforming.

CONTROL AND TRANSFER SWITCHES, GEA-4746B. General Electric Co., Schenectady 5, New York. A 28-page bulletin, covering General Electric's line of control and transfer switches for low voltage applications up to 600 volts AC or DC. Includes photos, etc. of special features and application data.

TRUCKS FOR THE LOGGING INDUSTRY, by White Motor Co., Autocar Division, Exton, Pennsylvania.

DEVELOPMENT BULLETIN—FLUID LOSS ADDITIVES, by Dowell Inc., P.O. Box 536, Tulsa 1, Oklahoma. Requests should be directed to the Advertising Dept. of Dowell.

## Reports and Surveys

ONCE MORE ABOUT MECHANICAL OCTANES. Presented at the SAE annual meeting at the Statler and Sheraton-Cadillac Hotels, Detroit, Michigan, January 9-13, 1956.

GENERAL OIL PRODUCTION STATISTICS FOR COLOMBIA IN 1955. The Texas Petroleum Co. A report published from data supplied by oil companies in Columbia.

26TH ANNUAL RESUME OF ROCKY MOUNTAIN OIL AND GAS OPERATIONS FOR 1955. Petroleum Information, 1640 Grant Street, Denver, Colo. $10. Covers all developments in the Rocky Mountain area last year, including reserves and maps of drilling. About 350 pages.

EUROPEAN TECHNICAL DIGEST. The Organization of European Economic Co-operation, 2000 P St., NW, Washington, D. C. $24.00 per year.

This technical digest is being made available to subscribers in the United States. The monthly Journal is published in Paris at the headquarters of the European Productivity Agency (EPA), a branch of the Organization for European Economic Co-operation. Over one thousand European periodicals are surveyed regularly and technical articles selected.

DETERMINATION OF CARBON DIOXIDE IN WATER BY CONDUCTIVITY MEASUREMENTS—TECHNICAL PAPER No. 133, by W. H. & L. D. Betz, Gillingham and Worth Streets, Philadelphia, Pa., consultants on industrial water problems. This paper describes a new method for determination of carbon dioxide applicable to analysis of waterside deposits, treatment chemicals and organic carbon in water by the principle of differential conductivity. Obtainable from W. H. & L. D. Betz at the above address.

CURRENT SAFETY TOPICS IN THE PETROLEUM INDUSTRY. A compilation of 15 papers and symposia on safety topics, presented in sessions of the Petroleum Section of the 43rd National Safety Congress. Available through National Safety Council, 425 North Michigan Avenue, Chicago 11, Illinois.

SHELL

The first commercial hydro-desulphurising unit applying the Shell Trickle Phase technique was commissioned at the Stanlow Refinery in April 1955. The performance of this unit has exceeded expectation.

The Spence Cobalt and Molybdenum Oxides on Alumina catalyst used was developed especially for its high selectivity, stability, and mechanical strength.

*Shell Trickle Phase hydrodesulphurisation unit, Stanlow refinery. A Shell photograph.*

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## Oil at the Fifth World Power Conference

*(Continued from page 65)*

season to one-tenth of the recorded peak. The hydrologic potential of many countries is nearing its maximum, and untapped reserves (gauged by the present technical means) are very small.

Twenty papers on atomic energy and connected problems were presented at the Fifth World Conference. Of particular interest was what the smaller countries had to report on their progressing research and development. India, for example, supplied an estimate of her reserves of radioactive materials, and disclosed that she possesses the largest thorium reserves in the world as well as reserves estimated at 15,000 m. tons of pure uranium. Two further reports deal with the economics of nuclear power. Although none gave a clear-cut answer as to whether this much-heralded source is competitive or not, they nonetheless pointed out the many complexities involved in its development. All in all, the impression left was again that atomic power is still in an embryonic stage of commercial development and that its economics are far from being set on a firm basis.

Noticeable at the Conference was the absence of any comprehensive study on energy developments in underdeveloped countries. Only very few reports on national energy developments attempted to assess the future demand by taking into consideration all economic, demographic and financial factors involved. In this respect, Japan's estimate was, perhaps, the most complete and illuminating report.

As a footnote, one may list again the difficulties with which energy statistics have been struggling for years, including terminology, conversion factors and bringing all energy sources to a common denominator. Despite these difficulties, a rewarding opportunity was offered by the Fifth World Power Conference to take stock of the world's energy sources and to take a glance into that elusive element called future.

END

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It's quite a large office. It has to be because it covers all of Canada. This is the office of the newly-formed Natural Resources Development Department of Imperial Bank of Canada. From this new office we investigate the potential resource development fields, and gather information and statistics concerning new and established development areas. Mr. R. J. Redrupp, Superintendent of the Natural Resources Development Department, is able to offer financial advice and assistance to businessmen engaged in developing Canada's rich natural resources. He works closely with Mr. A. S. de Rosenroll, Imperial Bank's resident specialist to the oil industry at Calgary, Alberta. This vital new department, first of its kind in a Canadian bank, is another example of Imperial Bank leadership.

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## Dr. Farkas Joins Houdry

Dr. Adalbert Farkas has joined the research and development division of Houdry Process Corp. as section chief in exploratory research at the Houdry Laboratories in Linwood, Pa. Dr. Farkas will direct research on new chemicals and chemical processes.

## Erratum

On page six of our July 1 issue, mention was made of Mr. S. M. James' receiving the Meritorious Safety Award from the "Associated Petroleum Institute of America". The correct title is American Petroleum Institute.

## Oil Sets New Records in 1955

The petroleum industry in 1955 by established new highs in consumption, in earnings and dividend payments, and in capital expeditures for production and other facilities, according to an annual financial analysis by The Chase Manhattan Bank.

Gross fixed assets of the entire oil industry in the free world now stand at approximately $63 billion; 64% of which is invested in facilities located in the United States. The free world use of crude oil and refined products in 1955 reached 14.4 million b/d, an increase of 10.6% over 1954 consumption, and a gain of 103% over 1946. Crude oil production last year averaged 13.7 million b/d, 11.7% above 1954.

Thirty-four major American oil companies which produced about 58% and refined about 65% of the 1955 free world's crude supply, had earnings of $2,668 million in 1955, as against $2,319 million in 1954. The group paid out $1,117 million in cash dividends in 1955, or 41.9% of earnings. Stock and other dividends totalled $366 million. Capital expenditure by the group amounted to $3,905 million in 1955, a new record. These figures do not include exploratory expenses and lease rentals incident to the finding and developing of new crude oil and natural gas reserves, which amounted last year to $434 million and were deducted from earnings.

Combined total assets of these companies stood at $29,095 million at the end of 1955, consisting of current assets—$9,838 million, net fixed assets—$17,345 million, and other assets—$1,912 million. Borrowed and invested capital employed by the group totalled $24,467 million, of which $3,391 million or 13.9% represented long-term debt.

## Otis Makes New Assignments

Otis Pressure Control, Inc., and its manufacturing affiliate, Otis Engineering Corp., have announced a realignment of executive personnel in the general offices and manufacturing plant in Dallas. The new job assignments are as follows: Lowell M. Wilhoit, vice president in charge of engineering for Otis Engineering Corp. James E. McGinley, director of sales and service, Otis Pressure Control; Kenneth W. Robbins, director of export department sales and service. Warner M. Kelly, service manager; Carl M. Schwab, Houston, division manager for Otis Pressure Control; Harry M. Schramm, vice president in charge of research and development for Otis Engineering; Stanley Noska, plant superintendent.

## Hydraulic Fluid Fire-Resistant

New "snuffer" type hydraulic fluid whose fire-resistant qualities prevent it from burning on contact with flames, heated metal surfaces or molten metal, has been introduced by the Shell Oil Co., New York, under the trade name Irus Fluid 902.

## National Octane Average Up

Fifteen cities had averaged premium gasoline research octane numbers of 97 or more, with the national weighted average 96.5, according to the quarterly motor gasoline survey released today by the DuPont Co.'s Petroleum Chemicals Division.

The national weighted premium average increased by five-tenths of a point since the last survey was published in April. Average regular gasoline rating was up four-tenths of a point from the April figure of 89. The combined premium and regular weighted average for the total United States gasoline pool was 91.5 octane numbers in the last survey, up four-tenths of a point from April.

# Scammell

## FOUR AND SIX WHEEL DRIVE TRUCKS

*Illustration above shows one of the many 6 x 6 Scammell "Constructor" Oilfields Bed Tractors operating in Kuwait and other major oilfields of the world.*

## Built to 'take it' *on or off the highway*

*Scammell 4 x 4 "Mountaineer" Oilfield Tractor.*

Scammell four and six wheel drive trucks have been specially designed for operation under the most gruelling conditions. In tropical heat, in the Arctic snowy wastes, in soft, sandy or mountainous terrain—in fact wherever the going is rough and tough Scammell trucks provide the complete, economical and reliable answer for every type of oilfield transportation.

Scammell four and six wheel drive oilfield type trucks and tractors have chassis designed for mounting Well-servicing Hoists, Cranes, Excavators, Drill Rigs, Cement Transit Mixers, etc., etc.

Further details gladly sent on request.

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# Oil Company Staff Changes

**BEN HAKE,** assistant to the vice president of Western Gulf Oil Co., has been appointed general manager in charge of Gulf's recently acquired oil concession on the eastern flank of the Andes in central Bolivia. Mr. Hake has worked in the oil business in Canada and Mexico as well as the U.S. He was with Marland Oil Co. for eight years in all three countries, and then eight years with Nordon Corp., of Alberta Ltd. in Canada. He joined Gulf 22 years ago and was assistant to the vice president in charge of production before joining Western Gulf. His new headquarters will he in Cochabamba, Bolivia.

**W. A. M. GREEVEN,** a director of Creole Petroleum Corp., has been appointed deputy coordinator of the world-wide marketing activities of Standard Oil Co. (N.J.) William W. Bryan and W. F. Spath, former marketing executives of Esso Standard Oil Co., were named assistant marketing coordinators.

**M. E. FOSTER** has retired as president of Phillips Pipe Line Co., and manager of supply and transportation for Phillips Petroleum Co. after 32 years. He is opening an office in the Price Tower, Bartlesville, Oklahoma, as consultant in the transportation and supply field.

Mr. Foster was an officer in the Coast Artillery in World War I and subsequently served with several Oklahoma oil companies before joining Phillips in 1923.

**JOSEPH TAYLOR FLY,** general counsel and a director of the Creole Petroleum Corp., has retired. Mr. Fly has been associated with Latin-American petroleum and legal affairs since 1920. He joined Creole, Venezuelan affiliate of Standard Oil Co. (N.J.) in 1942 and was previously a member of Jersey Standards Latin-American legal staff from 1935.

**B. W. S. DODGE** has been appointed director of the new advertising and sales promotion department of Gulf Oil Corp. E. F. Jacobs has been appointed as merchandising manager, another newly created post. Mr. Jacobs formerly was director, sales promotion.

**BERNARDO J. CAYCEDO** has announced his resignation as chief counsel of Texas Petroleum Co., in Bogota, to enter private practice specializing in petroleum with offices at Bogota, Colombia.

**LESTER H. BARNES** has been promoted to superintendent of the Ponca City refinery of Continental Oil Co.

**BRUCE K. BROWN** has been appointed president of Petroleum Chemicals, Inc. Mr. Brown, former deputy administrator of the Petroleum Administration for Defense, is currently president of Pan-Am Southern Corp. but will join Petroleum Chemicals, Inc., later in 1956 when Pan-Am Southern is merged with another company. Headquarters of Petroleum Chemicals, Inc., which is jointly owned by Continental Oil Co. and Cities Service Co., will be moved from New York to New Orleans.

**JOHN L. BIBLE** has been named vice president in charge of gravity, magnetic and radiometric operations of Southern Geophysical Co., seismic survey organization. He will headquarter in the firm's Houston offices. Mr. Bible has 20 years' experience in surveys, research, instrumentation and interpretation. Educated at Indiana University, he served for several years as a research physicist and was in charge of gravity and magnetic research for Stanolind Oil & Gas Co. After a period as executive vice-president of North American Geophysical Co., he became president of Tidelands Exploration Co., which position he left to join Southern.

**JOHN E. BELL** has been appointed chief engineer of Sinclair Refining Co.'s manufacturing department. Mr. Bell succeeds Thomas D. Tifft who is retiring after 36 years with Sinclair. Donald E. Hanson has been named assistant chief engineer of the manufacturing department, the post formerly held by Mr. Bell.

**F. O. KOONTZ,** vice president of Quaker State Oil Refining Corp., has been elected to the newly-created post of executive vice president. Dr. C. W. Georgi, research director, J. P. Healy, manager of oil properties and pipe lines, and E. E. Ebner, general superintendent of refineries, all directors of Quaker State, have been elected vice presidents.

**H. W. HARTS** has resigned as a vice president of Warren Petroleum Corp., Tulsa, because of ill health. He was badly injured in an automobile accident last October. He had been head of Warren's Manufacturing division for more than 20 years. He was with Amerada Petroleum Corp. for 10 years before Warren bought that company's natural gasoline plants in 1935.

**W. A. BURNETT,** distribution superintendent of the New York division of Shell Oil Co., will become manager of the fleet division, marketing distribution, head office, New York. Mr. Burnett replaces J. M. McGinnis, who will become operations manager of the Boston division. W. L. Shaw, Boston operations manager, will become operations manager in Los Angeles, replacing C. P. Woodward who is on a leave of absence.

**THORNTON F. BRADSHAW** has been appointed assistant general manager of accounting and analytical services of The Atlantic Refining Co.

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**ROBERT E. KINGSLEY** has joined International Petroleum Co. Ltd. as public relations advisor.

**H. F. TOMFOHRDE,** Jr. has been appointed manager of the newly-created lubricants supply deparment of Tidewater Oil Co.'s eastern division. He was formerly assistant to the vice president and divisional general manager.

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*John E. Bell*

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*Thomas B. Kimball*

*William R. Argyle*

**THOMAS B. KIMBALL** has been appointed vice president and director of manufacturing of Sinclair Refining to succeed William R. Argyle who retired July 1 after 37 years with Sinclair. Mr. Argyle will continue to serve the company in a consulting capacity.

Mr. Kimball has been general manager of refineries since October, 1953, and a member of the Sinclair organization since 1930. He joined the company at that time in the research and development department at East Chicago, Ind. Before being transferred to New York in 1943, he was in charge of the cracking division and of process engineering and development of light oil processes for Sinclair refineries. He was appointed assistant manager of refineries in 1950 and later was general manager.

*A. Bruce Boehm*

**A. BRUCE BOEHM** has been elected to the new position of executive vice president of Enjay Co., Inc. He has been a vice president of Enjay and sales manager of the firm's butyl rubber division.

## Venezuela Refining & Exports

Crude throughput at refineries in Venezuela during January came to 18,251,744 barrels; products obtained came to 18,732,048 including crude transferred to fuel oil.

Exports of crude for the month came to 53,462,339 bbls. Major destinations were: Aruba, 15,671,176 bbls. U. S., 11,280,675 bbls.; Curacao, 10,157,614 bbls.; Canada, 6,398,534 bbls.; U. K., 2,261,777 bbls.

Exports of refined products for the month came to 14,305,731 bbls. Major destinations were: U. S., 7,790,599 bbls.; Brazil, 1,177,136 bbls.; U. K., 1,058,934 bbls.

## New Mobil Oil Co. of Mexico President

J. Donald Charlton is the new president and general manager of the Mobil Oil Co. of Mexico. Mr. Charlton began his career with the company in 1942. After wartime service as an officer in the Marines, he successfully held posts as production engineer, chief engineer. For six years he was general manager and territory director of Mobil Oil of Colombia before being named treasurer of Mobil Oil of Mexico in 1955.

He replaces Howard Bird, Jr., president of Mobil Oil of Mexico since 1951, who has returned to New York for reassignment.

## Products Pipe Line In Chile Considered

The Government of Chile is still considering letting private capital construct a $1.5 million oil products pipe line from Concon, site of its new refinery, to Santiago. Barring that, the government is considering construction of a line itself. Those for the line argue that the savings in transportation in the first two years will pay back the cost of the line.

The new $11 million refinery, with a topping capacity of 20,000 barrels daily, must be fed by oil imports, in part. Imports came to 1,406,900 barrels of crude oil in the first eight months of last year. At present, crude oil production is about 8,500 barrels daily, some 42% ahead of a year ago.

## Chilean Production, Refining Up

Chile's crude oil production during 1955 averaged 6,796 b/d, rising to 9,202 b/d in April of 1956.

Crude runs to stills in 1955 at the Manantiales and Concon oil refineries were 244,397 barrels at the former, 4,463,445 barrels at the latter.

| 1955 (barrels) | Manantiales | Concon |
|---|---|---|
| Motor Fuel | 81,607 | 1,724,441 |
| Diesel Oil | 77,976 | 664,510 |
| Kerosine | 11,310 | 137,839 |
| Bottom Stills | 73,504 | — |
| Fuel Oil No. 5 | | 1,290,794 |
| Fuel Oil No. 6 | | 646,361 |
| TOTAL | 244,397 | 4,463,945 |

Chile's imports of crude oil and products came to 10,855,289 barrels. The figures by product, and by country of source were:

| | | | |
|---|---|---|---|
| Crude Oil | 2,092,600 | Grease | 13,579 |
| Kerosine | 1,193,261 | Asphalt | 8,031 |
| Gasoline | 1,671,225 | Varsol & Solvent | 33,101 |
| Diesel | 963,923 | Waxes | 20,294 |
| Fuel Oil | 4,715,788 | Vaseline | 189 |
| Lube Oils | 143,348 | TOTAL | 10,855,289 |

*By Source—Product Imports (Bbls.)*

| | | | |
|---|---|---|---|
| U. S. A. | 2,320,561 | | |
| Peru | 1,951,672 | Arabia | 137,261 |
| Aruba | 2,129,791 | Holland | 7,310 |
| Curacao | 1,356,775 | India | 2,893 |
| Venezuela | 2,934,998 | Belgium | 93 |
| Bolivia | 11,325 | Germany | 2,610 |
| | | | 10,855,289 |

## Moves to Havana

C. C. Bimel, who has managed Imperial Oil's crude purchasing division at Calgary since 1951, will move to Havana, Cuba, to become manager, on June 1, of the supply and transportation department of Esso Standard Oil, S.A.

## Pemex Introduces New Gasoline

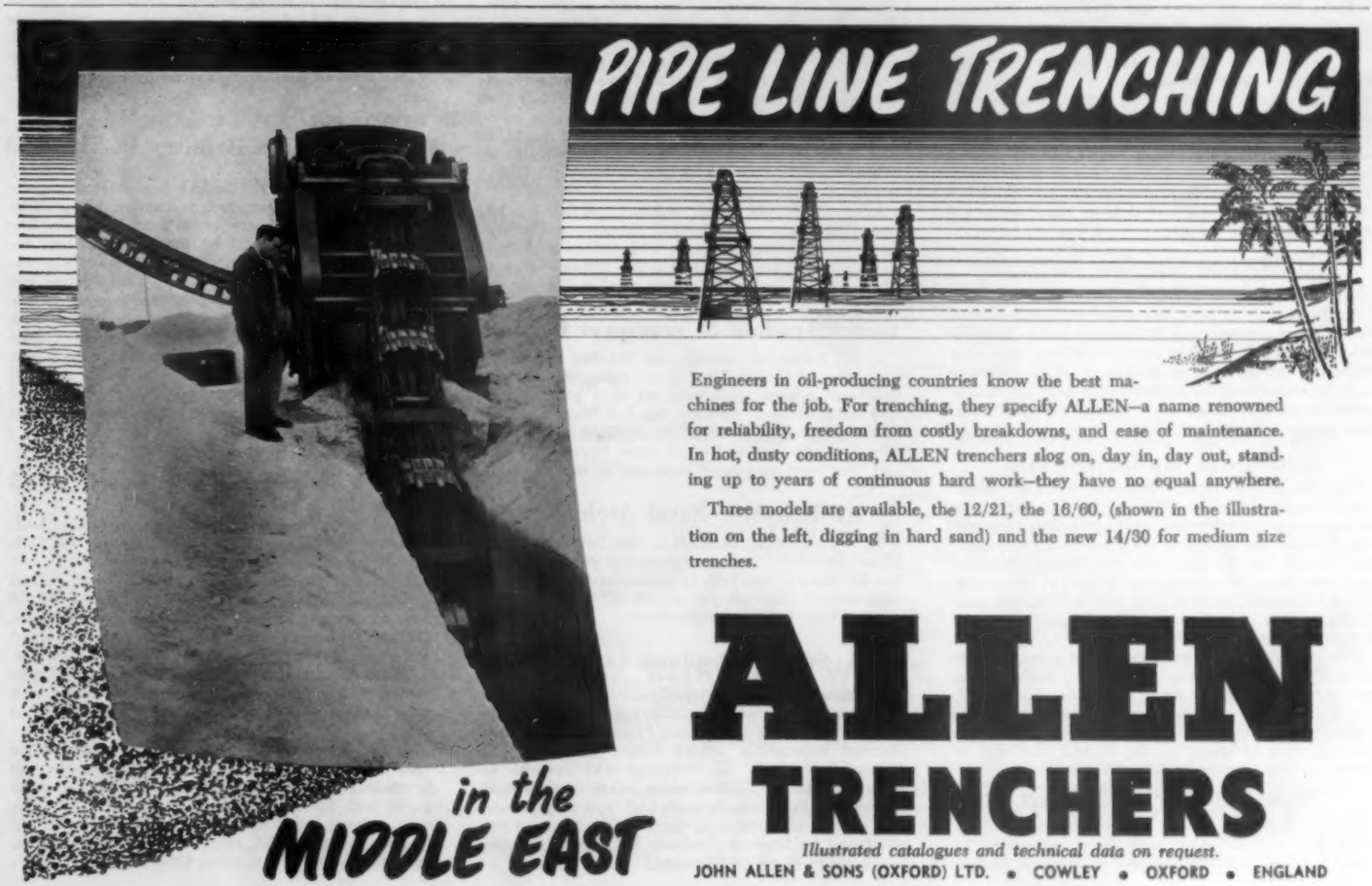
Petroleos Mexicanos will launch a 90-to-92 octane "anti-knock" automobile gasoline on the domestic market, it was announced by the government oil agency. The decision was taken, Pemex officials said, at the instance of local automobile assembly plants who complained that present gasolines—"Mexolina" and "Supermexolina"—are not suitable for late-model high-compression motors. Production of the new fuel, which will be known as "Gasolmex" although it was immediately christened "Super-Supermexolina" by the public, will be limited to the Atzcapotzalco refinery in Mexico City although it is planned to extend its manufacture later to the Minatitlan, Ciudad Madero and Salamanca refineries. Its distribution also will be confined at first to gas stations in the wealthier Mexico City residential districts. At this writing, its price still has not been determined by the Economy Ministry but it is expected to retail at from 90 to 95 centavos (7.2 to 7.6 U.S. cents) a liter.

## New Refinery in Mexico

Petroleos Mexicanos will erect a complete city, according to reports, featuring a 300,000,000-peso refinery in the State of Tabasco, on the strength of its new oil field at Macuspana. Construction of the urban center, to be called "Pemex City," was ordered by President Adolfo Ruiz Cortines after the government oil agency's technicians reported neither Macuspana nor any other nearby site posseas the facilities necessary for a refinery.

Studies by Pemex engineers indicate Macuspana's production will come to around 20,000 barrels of gasoline a day as well as at least 300,000,000 cubic feet of gas. They predict these products will be piped to Minatitlan and Coatzacoalcos in Veracruz and will eventually bring about the conversion of agricultural Tabasco into an industrial center.

Meanwhile, a brief announcement by Pemex director Antonio J. Bermudez said the oil agency is planning to spend some 470,000,000 pesos on modernization of its refineries in northern Mexico and intensification of drilling at Altamira in Gamaulipas.


Engineers in oil-producing countries know the best machines for the job. For trenching, they specify ALLEN—a name renowned for reliability, freedom from costly breakdowns, and ease of maintenance. In hot, dusty conditions, ALLEN trenchers slog on, day in, day out, standing up to years of continuous hard work—they have no equal anywhere.

Three models are available, the 12/21, the 16/60, (shown in the illustration on the left, digging in hard sand) and the new 14/30 for medium size trenches.

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# London Letter

## By E. Lawson Lomax

Following on the announcement made in April by The Esso Petroleum Co. Ltd., that plants were to be erected at the Fawley refinery for the manufacture of chemicals-from-oil at an estimated cost of £9 ($25.2) million, the same firm has made public its intention to carry out a further expansion program at an estimated cost of £13 ($36.4) million.

This latest development is being undertaken in order to meet the U.K.'s expanding requirements for fuel oil, and is expected to be completed by the end of 1958.

The principal items in this expansion program will be:

1. One crude oil distillation unit, capacity 70,000 b/d.
2. Two autodiesel hydrofiners.
3. A second sulfur recovery plant with a capacity of 14,000 tons of chemically pure sulfur per annum. The output of the present sulfur plant is entirely taken up by the textile industry.
4. Additional tankage capacity for crude and refined products.
5. The addition of a fifth jetty berth at the marine terminal, to enable five ocean going tankers to be berthed simultaneously.
6. A new oil and water separator plant, which will duplicate the facilities for the purification of refinery waste water before it is discharged into Southampton Water.

It is estimated that over 90% of all the materials required for this new construction will be of British manufacture. In the original Fawley scheme, owing to long delivery dates of British materials the percentage was only about 66.

The Southern Gas Board has concluded a ten-year agreement with Esso Petroleum Co., under which a total of about 17 million therms a year of refinery gas will be supplied to the Board. This gas will be reformed at the Board's works at Southampton and will give the equivalent of about 13 million therms of town's gas each year. It is expected that a saving of about 115,000 tons of coal per year will be made in this way.

A new 17-mile 15 inch main will be laid from Southampton to Portsmouth at a further cost of £200,000. The scheduled time for commencement of delivery of gas from the refinery into the new line is summer 1957. This saving of 115,000 tons of coal is approximately equivalent in calorific value to about 75,000 tons of fuel oil, and it is therefore obvious that the refinery plan at Fawley will have to be changed on its fuel side to cope with this external demand for gas.

### 100-Octane Gasoline on Sale in the U.K.

In the middle of July, the major oil companies in the U.K. announced that 100-octane motor gasoline was on sale at all their service stations, and now there are at least three grades of all proprietary blends available to the motorist. The new 100-octane grade is sold at a price about 4d. per gal. more than the previous premier grade.

### Petroleum Equipment List

The Council of British Manufacturers of Petroleum Equipment has published a new classified list of equipment and service, which is in five sections, No. 1 covers the names of the Executive Committee and the Officers, No. 2 is a list of Advisory Committees and their Members, No. 3 List of Members, No. 4 Index to Classified List, No. 5 Classified List of Equipment and Services. The Council now has a total of over 400 Member Firms.

The classified list of equipment and services must naturally be of great use to potential buyers, who are able to pinpoint their inquiries through it. The Council has also produced revised editions of January 1956 Hints on Overseas Travels. These two editions refer to travel in the Middle East and to travel in West Indies and South America.

### New Refinery for Ireland

Caltex (U.K.) Ltd., Esso Petroleum Co., Ltd. and Shell-Mex and BP Ltd. have been authorized to build a £12 ($33.6) million new refinery in Eire.

A new company to be registered in Erie, to own and operate a refinery in the Whitegate area, County Cork, is in process of formation. The project is in process design stage, and actual construction will commence in about 12 months. Scheduled time for completion of refinery is mid-1959. Capacity will be 1½-2 million tons per annum, products being mainly fuels i.e. motor spirits, diesel fuels, and a range of industrial fuels. Modern catalytic processes will be installed to ensure high quality products.

### American Gas Process

Power Gas Corp. Ltd. of Stockton has contracted with The Texas Co. to use the Texaco process for producing synthesis gas or town gas in the U.K. The process is a partial oxidation one and will produce carbon monoxide and hydrogen from a wide range of feed stocks, including heavy fuel oils, refinery gas and natural gas. The process is normally operated at about 350 psig and a sulfur resistant catalyst is used. Carbon dioxide is removed from the resultant gas by standard methods.

### Esso Land Purchase

Esso Petroleum, Ltd., has recently purchased over 300 acres of farming land adjacent to the Milford Docks area in Pembrokeshire, Wales. Esso has not announced the purpose of the land purchase.

The Clan Line and Union-Castle which are now merged into the British and Commonwealth Shipping Co., has entered the tanker shipping industry. One 16,000 dwt has been purchased from an associate Scottish Tanker Co. and three 18,000 dwt tankers have been ordered from John Brown & Co. (Clydebank), Ltd. The total investment will be over £5 ($14) million.

A. Onassis has ordered three new tankers from the Kieler Howaldtswerke A.G., Kiel, one of 65,000 dwt, one of 26,000 dwt, the third will probably be in the 40-65,000 dwt range.

Stavros Niarchos has changed the order he had placed with the same firm for one of 57,700 dwt and one of 39,500 dwt to two vessels each of the size of 65,000 dwt.

London and Overseas Tankers, a company registered in Bermuda has been formed by London & Overseas Freighters, a company controlled by Basil M. Mavroleon, and a group of London Financiers headed by Hill Philip, Higginson & Co. Ltd., Bankers. The company is ordering four new tankers, two from a British yard and two from a Swedish yard. The ships will sail under the British Flag and be manned by British officers.

Furness Shipbuilding Co. Ltd. launched the 32,000 dwt single screw turbine tanker "Arabian Gulf" for the Afran Transport Co. of Liberia (Gulf Oil Corp.) on July 10.

L. Redshaw, M. Eng., M.I.N.A., M.Inst.W., has been appointed an additional director of Vickers-Armstrongs (Shipbuilders), Ltd., effective August 1956. Mr. Redshaw will retain his present office of Shipbuilding General Manager of that Company.

### Caltex Trading & Transport Co. Ltd.

A. S. Runacres, manager of Bunker Sales and a director of Caltex Trading & Transport Co., Ltd., has been granted indefinite leave of absence and has resigned as a director. He has been with the organization for 25 years. Charles Beresford Clark, who recently joined Caltex from Regent Oil Co., Ltd. has been appointed manager of bunker sales.

### B.P.'s New Naval Architect

J. W. Ross, B.Sc., A.M.I.N.A., has been appointed naval architect in the engineering department of the BP Tanker Co., Ltd. in succession to F. Fenton, who retired June 30. He joined BP in 1939, after service with leading shipbuilders.

### Styrene Products Limited

Petrochemicals Ltd., a wholly-owned Shell Chemical subsidiary since July 1955, has acquired Erinoid's 40% holding in Styrene Products Ltd., which thereby becomes a wholly-owned subsidiary of Petrochemicals. L. H. Williams will remain as chairman and P. S. Chaumeton managing director of Styrene Products. Erinoid Ltd. will continue to sell polystyrene and polystyrene derivatives manufactured by Styrene Products Ltd. under the existing trade name of "Erinoid."

### New Japanese Oil Export Firm

A new petroleum export company made its debut in Tokyo in July under the sponsorship of leading Japanese business men and industrialists as a step to cope with rising over-supplies of refined products, particularly gasoline. The monthly gasoline production in Japan has far exceeded 250,000 kilolitres (about 1,750,000 bbls.) with month-end inventories threatening to mark an unprecedented high. The new company will specialize in exporting "cheap" Japanese gasoline and kerosine to southeast Asian markets such as the Philippines, Thailand, Hong Kong, Indonesia and Formosa. Taizo Ishizaka, president of Toshiba Electric, Shojiro Ishibashi, president of Bridgestone Tire, and Tsunejiro Hiratsuka, president of Nichiro Fisheries, are among the promoters.

### New Crude Import Contracts in Japan

Japanese oil refiners are apparently desirous of concluding long-term contracts for import of crude oil. Mitsubishi Oil has already concluded a three-year crude oil import contract with Compagnie Francaise des Petroles. Mitsubishi has a capital tie-up with Tidewater Associated Oil but no crude import contracts are in existence. Under the contract with the French firm, Mitsubishi will get about 700,000 tons (4.9 million barrels) of crude oil (Zubair) at around $1.73 per barrel. Mitsubishi is also negotiating with British Petroleum for the import of over 7,000,000 barrels of Kuwait crude oil (in a 3-year contract). Maruzen Oil, which concluded a contract with British Petroleum for purchasing 5.2 million barrels of Kuwait and Catur crudes is striving to increase the import volume. Kaikyo Oil, already having a contract with Compagnie Francaise des Petroles to buy nine tankerfuls of Zubair crude, is seriously considering the French offer to renew the contract for another few years.

In an effort to strengthen its front for exporting oil products to Southeast Asia, Maruzen Oil has approached British Petroleum Trading for a tieup. Under the contract envisaged by Maruzen Oil, the Japanese oil company plans to refine crude oil supplied by the British trading firm for marketing in the Southeast Asian market under the British trademark. The Japanese approach has been made on the strength of the recent news that British Petroleum Trading wants to enter the Southeast Asian market, previously shared by Shell and Caltex.

### Japanese Plans Refinery in Thailand

Maruzen Oil, Ltd. (Osaka) has started negotiations with the Japanese government for permission to have a refinery erected in Bangkok. The project, if realized, will be the first Japanese investment in Thailand under the economic cooperation program based on the Japan-Thai Special Yen Agreement. Maruzen's plan calls for construction of a refinery on the bank of the River Menam with a capacity of 5,000 b/d. Construction expenses, estimated at 5,000 million, will be financed with a loan either from Japan Export-Import Bank or Gulf Oil. Products of the proposed refinery would be marketed in Laos, Cambodia and other Southeast Asian countries.

### British Petroleum Expansion in 1955

Total sales by The British Petroleum Co., Ltd., increased by 15%, crude oil production by 25%, and refining throughput by 23% in 1955.

British Petroleum's sales of crude oil and refined products in 1955 were at an all-time high of 960,000 b/d, an increase of more than 120,000 b/d over 1954. Of this increase in sales, refined products accounted for nearly 80,000 b/d and crude oil some 50,000 b/d.

The company's crude oil production in 1955, obtained principally from the Middle East, rose to a new high of 920,000 b/d, compared with 740,000 in 1954.

Consolidated trading profit and other income for 1955 before depreciation and overseas taxation, as previously reported, amounted to $391,490,240, compared with $331,040,617 in the preceding year. Consolidated net profit was $126,863,080 after deducting United Kingdom and overseas taxes, depreciation and other write-offs totaling $264,627,160.

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**D. WOODSON RAMSEY, JR.**, coordinator of the world-wide marketing operations of Standard Oil Co. (N.J.), has been elected to the board of Esso Research and Engineering Co., Jersey Standard's scientific affiliate. Mr. Ramsey fills the vacancy created when William R. Scott was elected to the parent firm's board of directors last May.

**WILLIAM R. REMALIA** has been appointed manager of product supply in the supply and transportation department of American Oil Co. in New York.

**J. H. RUSSELL**, vice president in charge of pipe line operations in the United States, and W. G. Robinett, assistant comptroller, have resigned from Gulf Oil Corp. Both are veteran employees of the company with 35 and 41 years of service, respectively, in their fields of operation.

**FOSTER J. SCHEMPF** has been named general manager of Louisiana operations by John W. Mecom, Houston independent oil operator. He formerly was vice president and director of exploration for Stanolind Oil & Gas Co., Tulsa.

**ROBERT N. KOLM** has been named chief geologist for Atlantic Refining Co. at Dallas. He succeeds William B. Moore, who became manager of the newly formed Louisiana Gulf Coast region. Mr. Kolm formerly was assistant chief geologist. He has been with the company for 37 years.

The new Atlantic regional officers will be established at Lafayette, La. Establishment of the new region was made necessary by the recent purchase of producing properties of Houston Oil Co.

**E. J. KIRBERG**, coordinator, manufacturing department, Gulf Oil Corp., died July 19, in Washington, D. C. He joined Gulf at its Port Arthur, Texas refinery in 1922.

In October of last year, he was promoted to the position he held at the time of his death—coordinator, responsible for coordinating the operations of the manufacturing department with that of the other deparments in the company.

*R. C. Frederick*

**R. C. FREDERICK** has rejoined the Gulf Oil Corp. in the planning and economics department. In his new position, Mr. Frederick will be on the staff of P. H. Bohart, vice-president, as planning coordinator for natural gas liquids, gasolines, and liquified petroleum gas (LPGas).

**RICHARD G. MARMADUKE** has been appointed chief geologist for British American Oil Co., Dallas. He formerly was division geologist at Oklahoma City. He was succeeded there by Harold J. Reedy.

**WILLIAM B. PLUMMER** has retired as president of Indoil Chemical Co., Standard Oil Co. (Ind.) subsidiary. He will become a private consultant in the petrochemical field with headquarters in New York City after Sept. 1.

Effective August 15, J. H. Forrester has succeeded Mr. Plummer as president of Indoil Chemical Co. Mr. Forrester will also head up the new consolidated company which will take over Indoil and two other Standard Oil chemical subsidiaries later this year.

**ROBERT W. PACK** is retiring from Sun Oil Co. service after nine years as its director of production and as a director of the Co. For about 39 years he has been a key figure in Sun's production organization.

**FREDERICK R. PALIN** has been elected president of the Canadian Gas Assoc., at its annual meeting being held at Murray Bay, Quebec. He succeeds P. W. Geldard, as chief executive officer of the association which represents the gas industry through its 430 members. Mr. Palin is assistant general manager, secretary and treasurer of the Union Gas Co. of Canada, a firm he has been associated with since 1936.

**H. P. SCHOECK** has been appointed executive development coordinator of Standard Oil Co. (N.J.). This position was created in view of the growing importance to company interests of executive development interests of executive development programs existing in the organization. Mr. Schoeck also will serve as secretary of the compensation and executive development committee, and as a member and vice-chairman of the executive salary committee.

**STUART F. SILLOWAY** has been named president of Pacific Northwest Pipeline Corp. of Houston, Texas. C. R. Williams, who has directed the operations of Pacific since 1951, has been appointed vice chairman of the board of directors. As vice chairman, Mr. Williams will continue to be very active in the affairs of the natural gas transmission company soon to begin deliveries of natural gas in the Pacific Northwest.

**ARTHUR M. SHERWOOD** has been elected secretary of Socony Mobil Oil Co., Inc. He will succeed William D. Bickham, who retired after 27 years of service. Paul J. Buttles, who has been an assistant secretary, also retired. Theresa Jean Lutz and James J. McKay have been elected assistant secretaries to succeed Mr. Sherwood and Mr. Buttles. Miss Lutz is the first woman to become an officer of Socony Mobil.

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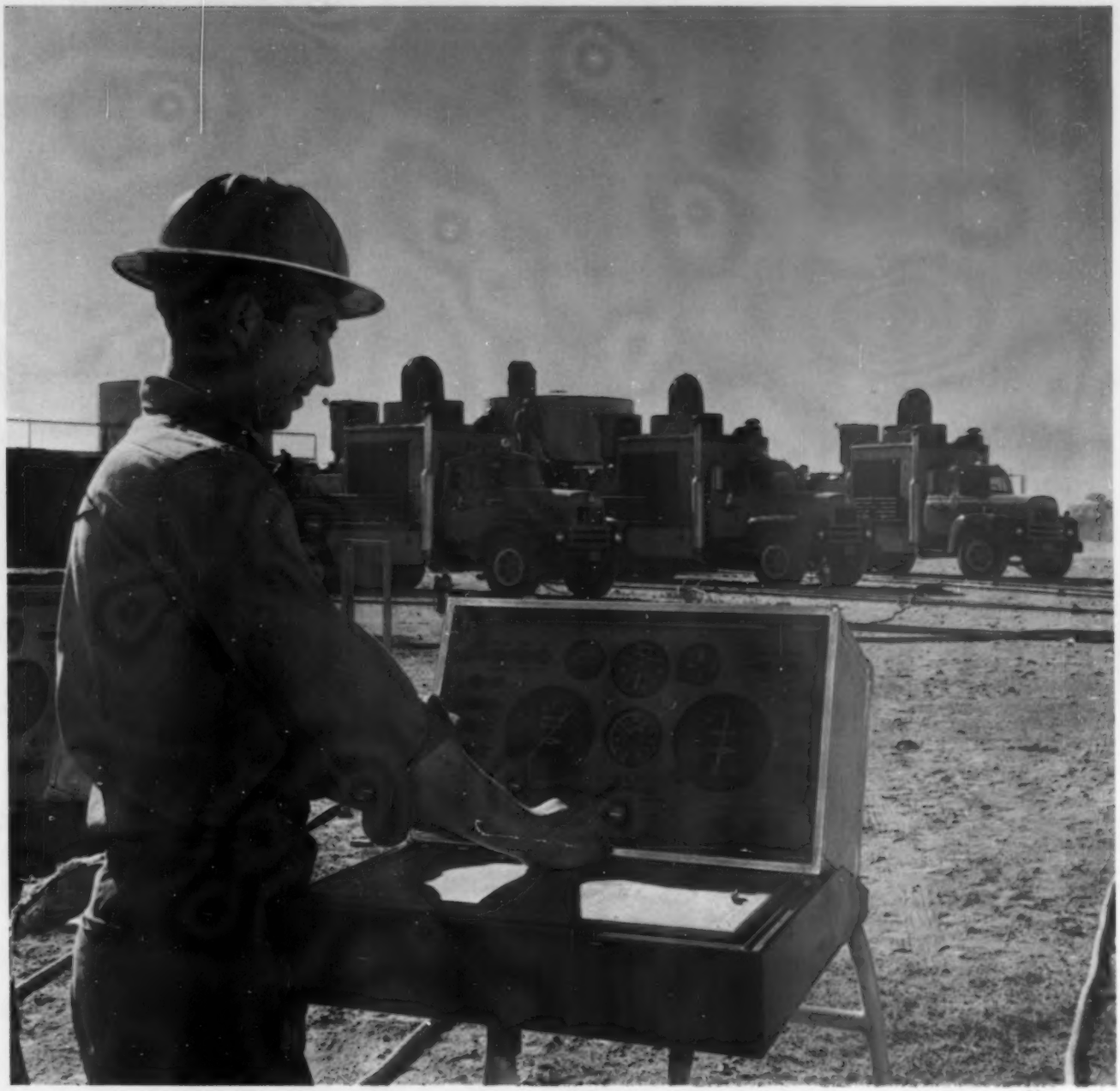

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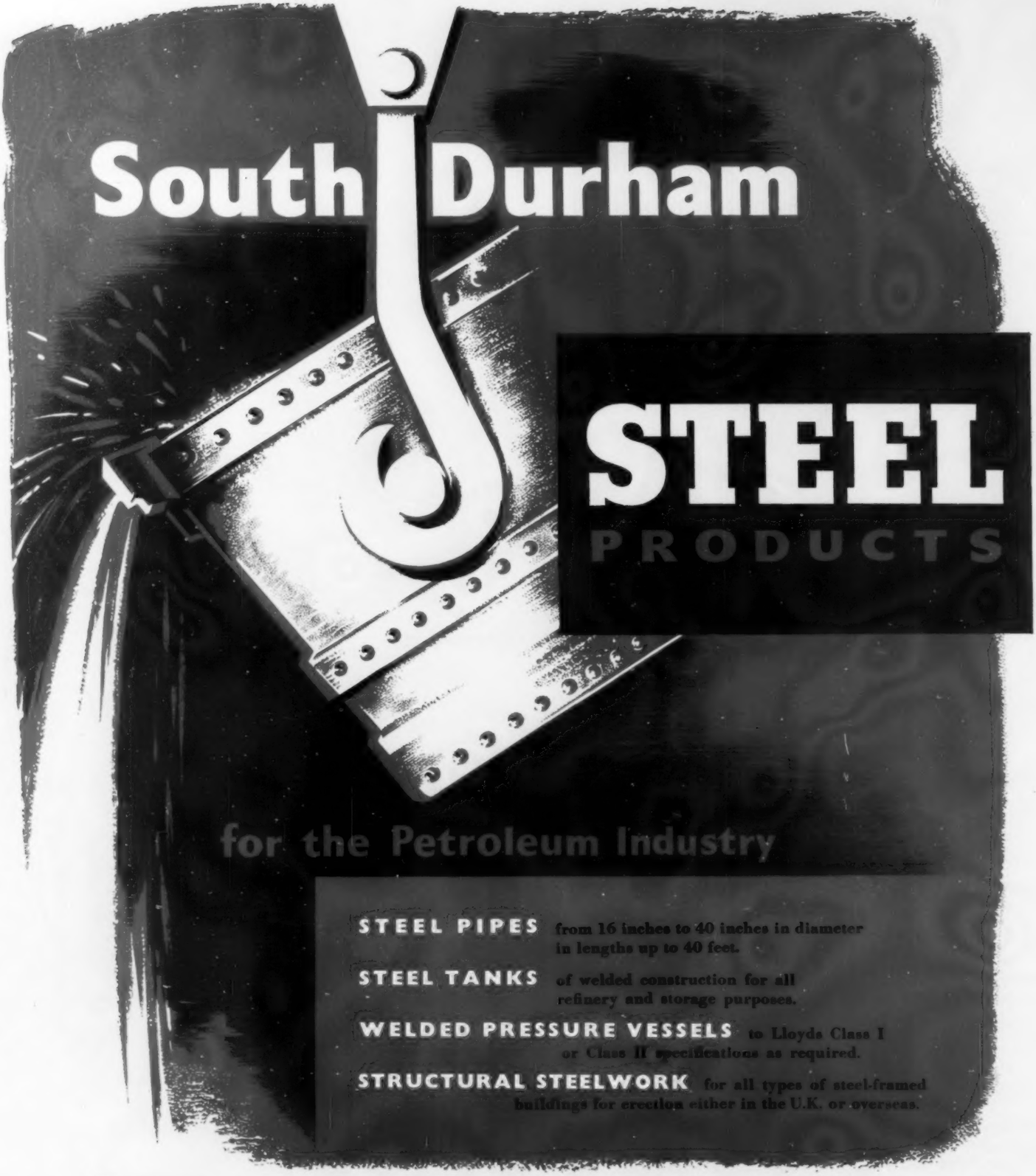

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## Buys Win-Well Assets

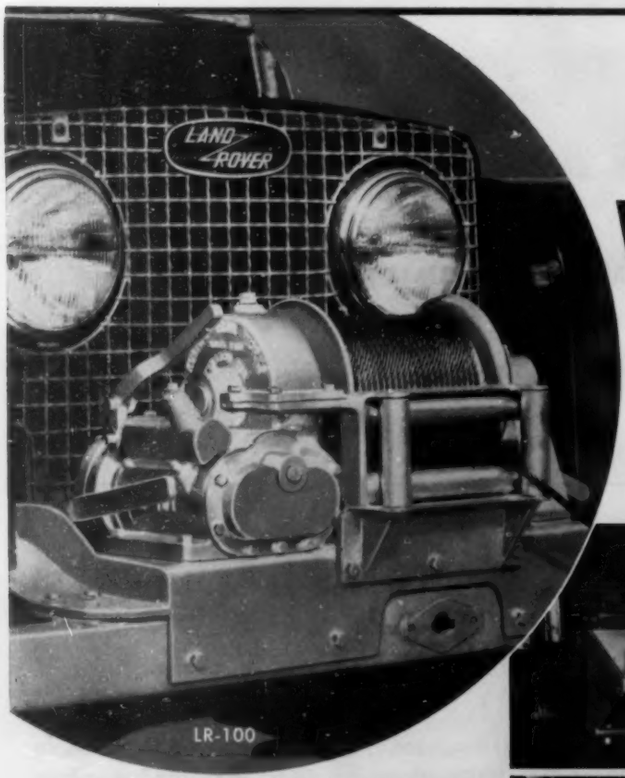
Crescent Corp. Tulsa, has acquired all the assets of Win-Well, Inc., of Los Angeles, and has formed a new corporation to be known as Win-Well Manufacturing Co., to manufacture and market the Win-Well 7-way multiport rotary selector valve.

The Win-Well valve is a rotary, multiport selector valve, designed for manual operation or automation, to eliminate complicated manifold systems in producing fields by bringing the product of as many as seven pipelines to a central source for sampling, metering and testing. One output line leads to consumption or storage facilities, and one intake may be tested at any given time without flow interruption or contamination from the remaining ports.

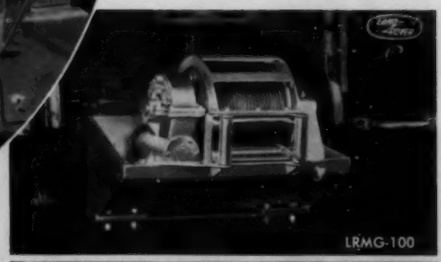
## Ohio Oil Co. Transfers Personnel to Libya

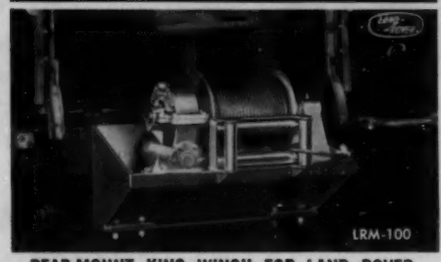
Among geological personnel of the Ohio Oil Co. who have been transferred to the Oasis Oil, the company's subsidiary in Libya are: James A Carter, Jr.; Presley L. DeJarnett; Donald M. DePriest; William A. Fowler, John O. Goffe, Warren C. Heisterkamp, Robert M. Hiles, Jr., William G. Noonan, John L. Redmond, Del L. Wiegand, and Joseph C. Wilson.

Albert F. Lager is resident manager of Oasis of Libya. V. L. Frost is manager of exploration and R. M. Bone is chief geophysicist. T. H. Jones, who headed exploration for Conorada in Libya, is chief geologist. C. M. Deckard and T. C. Buchanan will head Comptroller, and Supply and Transportation respectively.


The KING WINCH for LAND ROVER

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- ★ forward, neutral and reverse operating lever conveniently mounted on winch
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**W. VAUGHN ISCHIE** has been elected vice president and general manager of manufacturing, Sinclair Refining Co. He succeeds T. B. Kimball, recently named director of manufacturing.

Mr. Ischie joined Sinclair Refining Co. as a member of the research department at the East Chicago refinery in 1920. In 1930, he was transferred to the manufacturing department, later becoming operating superintendent of the East Chicago refinery, which position he held until February, 1952, when he was granted a year's leave of absence to accept the position of director of the foreign refining division of the Petroleum Administration for Defense in Washington, D. C. On his return from the PAD in 1953, he was appointed assistant to the refineries manager in the New York office.

**KINGSLEY V. SCHROEDER** of Beaumont, Texas, has been named director of production for Sun Oil Co. in the United States and Canada. He succeeds Robert W. Pack, who is retiring.

**KENNETH E. TOPPY** has been appointed superintendent of Ohio Oil Co.'s Wyoming pipe line division at Casper, Wyoming, to succeed the late Clare McElhinny. Mr. Toppy formerly headed the Lima, Ohio, division which now has been combined with the Martinsville, Illinois, division under W. K. Smith.

**C. T. CARTER** has been promoted to general manager of crude pipe lines, Sinclair Pipe Line Co. He was formerly head of the company's crude movements department.

*John E. McKay*

## McKay Joins Parsons

The Ralph M. Parsons Co. announces the appointment of John E. McKay to its business development staff.

Mr. McKay was formerly associated with The Fluor Corp., Ltd. for 14 years in various sales capacities. Prior positions were held with Sinclair Refining Co. and Carter Oil Co.

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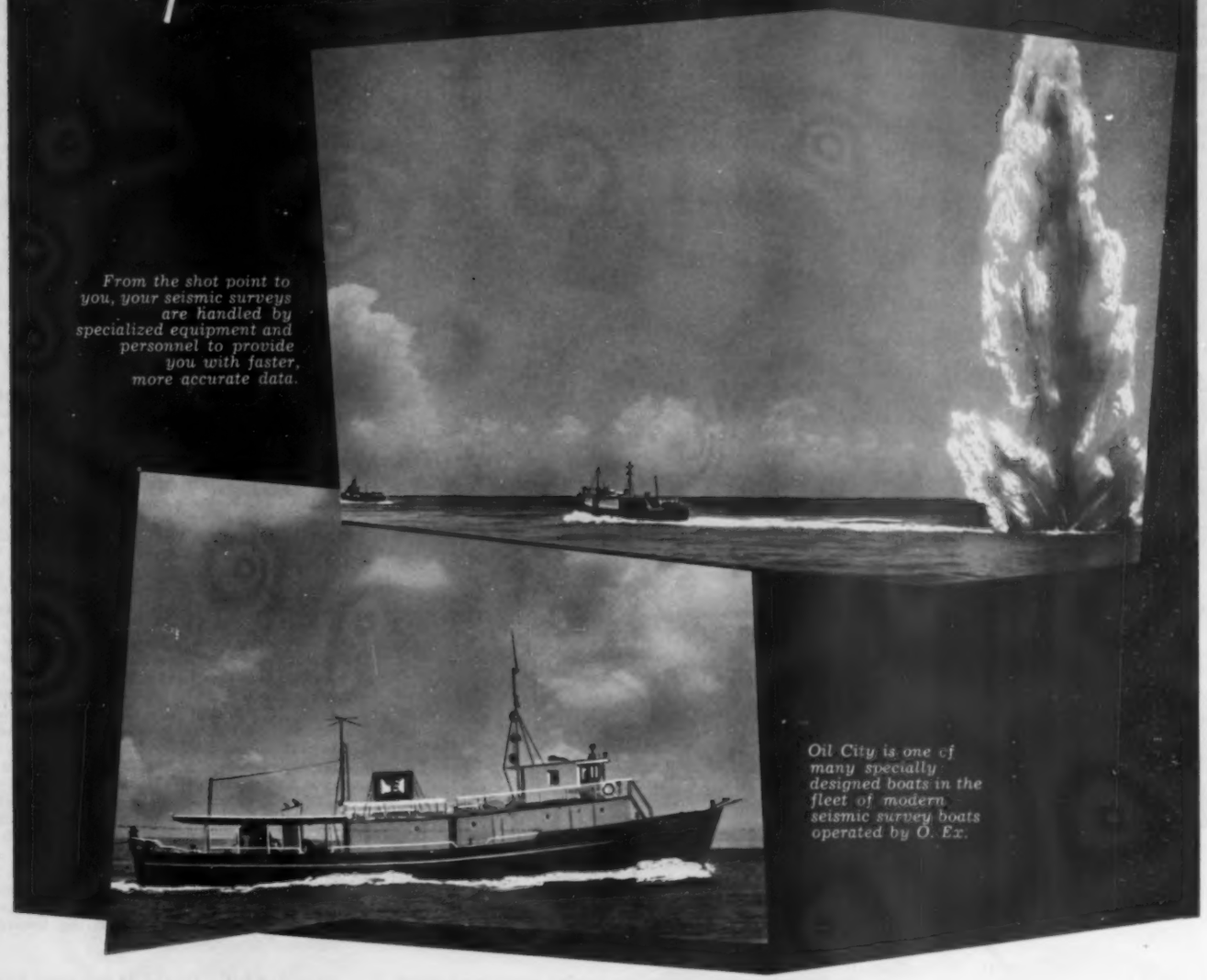

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## Increased Exploration in the Franc Area

(*Continued from page* 103)

amount invested by an individual in an exploring company prior to striking oil.

These are two important steps, but it does not end there. The number of individuals able to invest large sums of money in exploratory companies is small. Equally, the companies do not wish to burden themselves with large numbers of small shareholders, even if they should be forthcoming; and a capitalist might well hesitate to stake his all on one license. It has therefore been essential to find a formula whereby both large and small prospective investors could benefit from the financial advantages of oil exploration investment, by spreading the risk as widely as possible.

With this in view, the two investment companies Finarep and Cofirep were formed a year ago. These companies are considered as private individuals as regards the doubling of their investments by the State; they are exempted from tax on dividends and tax on companies' profits. Shares in these companies also carry a minimum dividend guaranteed by the State. In order to get as many as possible to subscribe to these shares, and to minimize the risk, each share subscription is limited to ten shares. The share issue of the two companies met with great success, and was covered several times over.

And now it is time to sum up by weighing up the pros and cons of the policy followed since 1945. This policy has considerably developed the resources made available for exploration purposes. The number of concerns engaged in prospecting has increased from eight in 1946 to 26 in 1955, and the total capital, over the same period from $21 million to $216 million.

The resources at the disposal of the exploring concerns have been similarly stepped up: 24 rigs drilled 1,300,000 feet in 1946, whereas 65 drilled more than 11 million feet in 1955. As for manpower, this has not increased so considerably, but has doubled—5,500 being employed in exploration in 1946, and 12,000 in 1955.

These figures show a remarkable progress in the results obtained through the increased financial effort in the field of oil exploration: the annual outlay has increased from $20 million in 1946 to $85 million in 1955. The growing number of companies and the ever-increasing capital invested have facilitated the progressive extension of exploration to new and larger areas.

This large-scale development of oil research led to substantially increased national production, and fresh discoveries encouraged renewed efforts. Thus in 1950 the discovery of an oilfield at Lacq, yielding 6,000 b/d, gave rise to further prospection in Aquitaine. In 1952, the Societe Nationale des Petroles d'Aquitaine, while completing deep prospecting in the Lacq license area, struck a deposit of sulphur gas at a depth of 13,000 feet, which was estimated to contain reserves of 3,500 billion cubic feet. In 1954 Esso Standard discovered the Parentis field, now yielding 25,000 b/d, confirming the oil-potential of this region.

Also in 1954 the discoveries of gas at Djebel Berga in the Sahara by the Compagnie de Recherches et d'Exploitation Petrolieres (CREPS) drew attention to this vast French-owned desert where as yet no oil had been struck. During the last few months this success has been followed up by the discovery in south-east Algeria of an oilfield at Edjelé where the first well has yielded 500 b/d. Six miles to the west, another well has been brought in with 700 b/d at Tinguentourine. In French Equatorial Africa a well is currently being developed which was discovered at the beginning of 1956 at Ozouri. A second well at Pointe-Clairette appears likely.

In addition, a number of very encouraging starts have been made in Metropolitan France, in Alsace and the Paris basin, as well as in Morocco, Algeria, Tunisia, and the Cameroons.

What have been the results of the policy followed since 1945? In 1946 the franc area produced 400,000 barrels of oil and 300,000,000 cubic feet of gas; in 1955 the figure for oil was 7,500,000 barrels and for gas, 10 billion cubic feet. The production of crude oil is therefore 20 times larger than it was ten years ago. France is the third biggest producer in Western Europe after Austria and Germany, her production equalling that of The Netherlands. It is obvious, however, that much still remains to be done, considering the annual consumption figure for the franc area of 18 million barrels. It is therefore essential to discover further sources of oil in the immediate future if national production is to equal national consumption. The results obtained in the Sahara and the Paris basin are very encouraging. In a few years the supplies of gas from Lacq will go a good way towards covering the power requirements of the French economy.

As for oil, optimism is certainly justified. As in all man's works, however, progress is only made at the price of constant effort, improved technical facilities, and a day-to-day striving towards the target. END

**What can *HARBORMASTER OUTBOARD PROPULSION* do for you?**

Harbormasters are complete marine power and steering units . . . *in one package . . . easily installed for immediate use* . . . combining outboard maneuverability with heavy-duty performance. Shown here are just some of the uses where their great maneuverability and heavy-duty performance are paying off.

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## Standard To Build Dewaxing Plant

Standard Oil Co. (Ind.) is building a new plant at Whiting, Ind., for dewaxing lubricating oils by means of urea, using a process developed by Standard Oil's research department.

## To Build Gasoline Plant

The Fluor Corp., Ltd., has been awarded a contract to design, engineer and construct a 300 mmcf gasoline plant at Eunice, La., for Union Oil & Gas Corp. of Louisiana, and Texas Gas Exploration Corp.

## New Supervisors at Tidewater

Nine supervisors have been named to the staff at Tidewater Oil Co.'s new 130,000 b/d refinery in Delaware. Named processing superintendents were Raymond M. Camp, Lloyd E. Forbes, David Haynes, Robert M. Hunt, and E. L. Raun. Robert B. Beattie was named superintendent of engineering, maintenance, and construction. R. S. Stanfield was named refinery representative. The new superintendent of technology is Dr. Arthur W. Lewis. Raymond Harrison Jr. was named superintendent of economic planning and accounting.

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*New Services • • • New Tools • • • New Methods • • • Outstanding Results*

## *McCullough Back-Off Service Aids in Recovery of an Extra 3600′ of Stuck Pipe*

In some stuck pipe conditions McCullough's Magna-Tector (Free Point Finder) will indicate that working the pipe may free it further down the hole. In this instance the stuck drill pipe was actually loosened 3,600′ below the original sticking point.

Operator was drilling at 5,668′ with 3½″ Full Hole Drill Pipe when pipe stuck. This was a 32° angle directional well.

McCullough was called to run their combination Magna-Tector, String Shot Back-Off. Lowest free point was found at 1,900′. However, the Magna-Tector reading indicated that the drill pipe might be freed further down the hole.

Pipe was worked for 2½ hours and the combination Magna-Tector, String Shot Back-Off was again run. Pipe was found to be free at 5,500′ at the top of the drill collars. The String Shot Back-Off was positioned and fired and pipe was recovered from that point—a bonus of 3,600′ of drill pipe.

McCullough's new combination "One Trip" Back-Off Service obtained the free point reading and fired the back-off shot on a single trip in the hole. Thus, all free pipe was backed off and started out of the well almost immediately after the lowest free point had been found—and before it had a chance to re-stick further back up the hole.

## Magna-Tector Helps Save 12 Days Fishing Time on Stuck Pipe Job

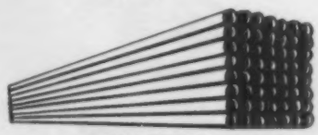
*Operator Estimated 21 Days to recover 7760′ of Stuck Drill Pipe—Job Actually Completed in 9 Days with Aid of McCullough Back-Off Service.*

The time-saving benefits of McCullough Back-Off Service in pipe recovery operations were strikingly demonstrated in this deep California well.

Operator was drilling at 11,360′ when 4½″ O.D. drill pipe became stuck. Only surface casing had been set and hole was open from 500′ to 11,360′.

McCullough was called immediately. The Magna-Tector (Free Point Finder) located the lowest free point in the stuck string at 3,600′. A String Shot Back-Off was fired at that point and the free pipe was removed from the hole.

At the time of the first back-off the Drilling Superintendent advised his head office that it would require an estimated 22 washover operations, 22 String Shot Back-Off shots and 21 days of rig time to recover the remaining 7,760′ of stuck drill pipe. However, due to reliable free point determination, the job was completed in only nine days. After each washover operation, McCullough's Magna-Tector was run to confirm that the washed-over pipe was free. In each instance the Magna-Tector discovered that pipe was free a considerable distance below the lowest washover point. McCullough's String Shot Back-Off successfully loosened the lowest free joint in every case and permitted fast recovery of the freed sections.




**Call for—McCULLOUGH BACK-OFF SERVICE**

McCullough "One Trip" Back-Off Service is now available in most service areas—performs all back-off operations in one electric wire line run in the hole—ask your McCullough Service Engineer.

Instead of 22 separate washover and back-off operations, the use of McCullough Back-Off Service enabled completion of the job in only four recovery operations.

Count the savings this operator made through his foresight in calling for McCullough Back-Off Service. Saved—18 String Shot Back-Off shots—18 separate washover operations—12 days rig time.

It pays to call for McCullough Back-Off Service. You'll save time—save pipe—save money!

**McCullough® TOOL COMPANY**

*Cable Address:* MACTOOL

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## Licenses Polyethylene Process

Steps have now been taken to commercialize the rigid polyethylene process developed by Standard Oil Co. (Ind.). Standard has licensed Eastman Kodak for commercial production of high-density polyethylene and polypropylene plastics under more than 20 patents issued since 1951. Other patents are pending. The Standard process is continuous and is produced with a granular catalyst which needs no regeneration.

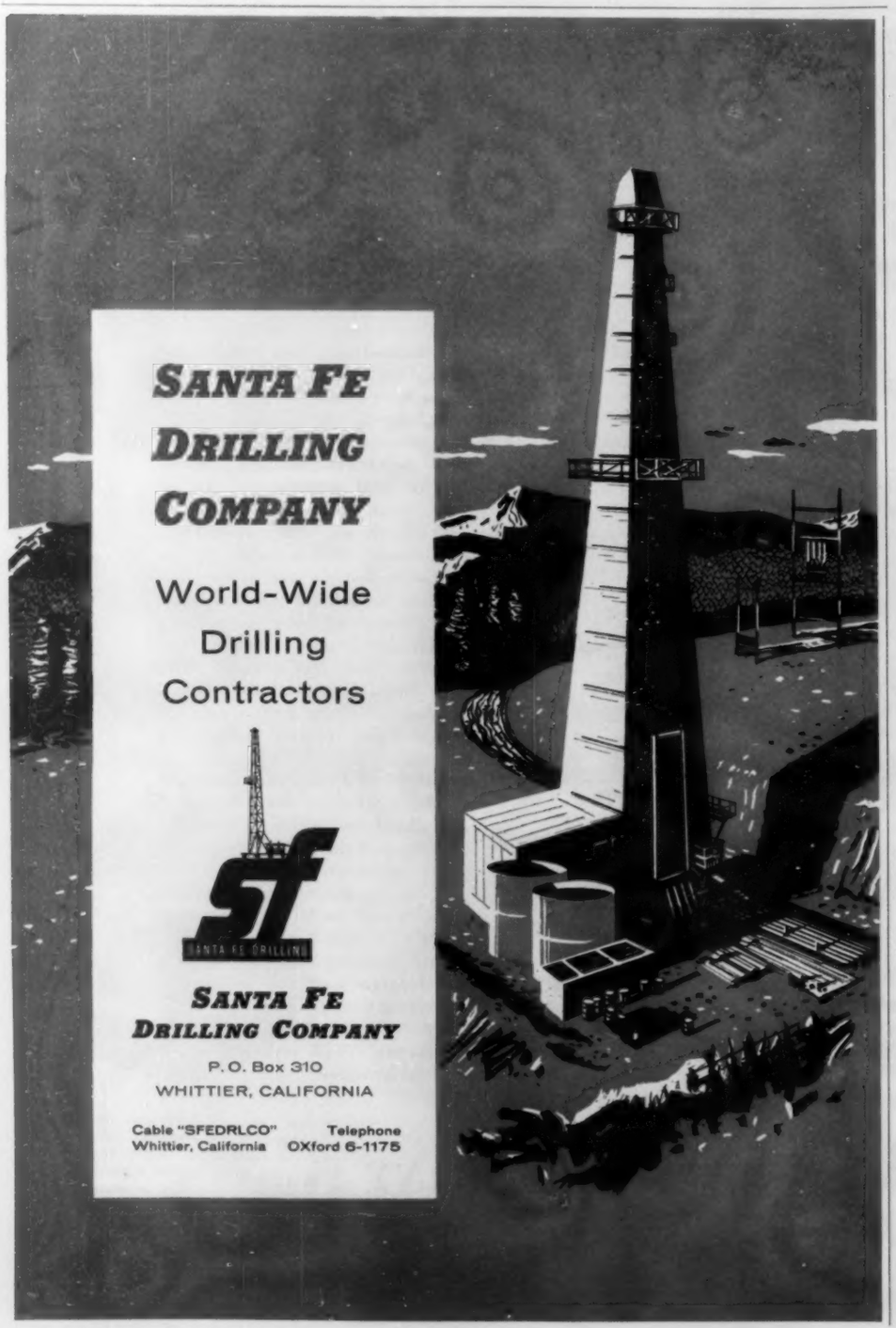
The polyethylene produced by the Standard process is high-melting, and is not affected by boiling water. The new product has high impact resistance, slow ash content and other advantages. It is expected to have wide application in the food packaging field and in the manufacture of unbreakable household and industrial products.

## APCO Contract to Procon

Anderson-Prichard Oil Corp. has awarded Procon Inc. a contract to engineer and construct at its Cyril refinery a 5,000 b/d fluid catalytic cracking unit, licensed by Universal Oil Products Co. The contract also includes engineering and construction of fractionation and light ends recovery facilities, as well as some revamp work of existing units. Work is scheduled to begin in July and will be completed about March 1, 1957.

## Heads Houston Sales

George H. Echols Jr., sales engineer for McCullough Tool has been appointed Houston district sales manager. He started with McCullough in 1951 in the Houston service department. Promoted to sales engineer in 1952, Mr. Echols served in the Beaumont area until his recent advancement.



## Promotes Technical Education

Universal Oil Products Co. has produced a documentary film to promote technical education and to interest young engineers in joining the company's staff. The film recounts the visit of an engineering student to UOP laboratories at Des Plaines, Ill., and to a new oil refinery.

Fifty prints of the film have been made and are loaned to schools and other organizations for projection. Requests should be made to Modern Talking Picture Service, Inc., Prudential Plaza, Chicago 1, Ill.

The public relations department of UPO under the management of Harvey Blankenship also has organized a speakers bureau of UOP technologists. Twelve of the company's top engineers are available to talk before civic organizations, educational institutions, technical societies or to make radio and television appearances. Requests for speakers are to be made direct to the public relations department of UOP at 30 Algonquin Road, Des Plaines, Illinois.

## UOP Sale Opposed By Independents

Proposal of the American Chemical Society to sell Universal Oil Product Co. to outside interests as a means of diversifying the investment portfolio of its education fund has created opposition among independent refiners. Petitions of intervention have been filed in the New York Supreme Court by the Independent Refiners Association of America and four individual refining companies. The individual companies are Aurora Gasoline Co., Frontier Refining Co., Eastern States Petroleum Co., Inc., and Ingram Products Co.

All of the intervenors assert that the trust was set up in the public interest until conditions should be changed and that no such change has taken place. It is alleged that in fact there is greater need for the impartial services of UOP than was the case in 1944, when the trust was established. They claim that for many years UOP has been in effect the research organization on which small companies had to rely for new refinery processes with which they could compete with major oil companies. They claim inability to carry on such research on their own account. It is asserted that the small company could take its ideas to UOP and have them developed confidentially.

One of the intervenors alleged that UOP designed and built its plant and is under contract to give technical service. The company fears that sale of the company to private interests would jeopardize its competitive position in the future. In all cases it is asserted that the public interest aspects of the trust extend to the independent refining industry as well as to the educational fund of the American Chemical Society.

When the proposal to sell UOP stock first was made by the Society it was the aim of the chemists to use money obtained by the sale to buy a diversified group of securities. The society felt it unwise to have all its eggs in one basket.

The Guaranty Trust Co., trustee under the gift to the society, asked a sales commission of 10% which was opposed by New York Attorney General Javits. Filtroil Corp. asked that sealed bids be filed with the Supreme Court by prospective buyers, each to be accompanied by a deposit of $5 million. A referee has been appointed who will hear the views of various parties and make a recommendation to the court.

## Asphalt Pavement Tester

A sliding plate microviscometer that makes possible the first accurate predictions of the life expectancy of asphalts is now available for general use. Shell Oil Co. has announced the instrument measures the resistance to flow of asphalt under carefully controlled temperatures and shear forces. Its accurate measurements permit selection of asphalts with proper viscosity and great resistance to change—and thus construction of uniformly superior asphalt roads. It provides precise answers to questions that paving experts previously had to handle in general terms.

The instrument is being manufactured by Hallikainen Instruments, Berkeley, Calif. Detailed information and technical data are available from Shell Oil Co.

# CANADA *to* KUWAIT

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*Pronounced "Inner Clad"*

## *Reed's advanced hard metal application for Tool Joints...*

Inarclad utilizes Reedite hard metal to protect tool joints as do Reed's two other methods (Surface Concentration and Deep Penetration) . . . but . . . Inarclad differs in the process used in that Inarclad welds the hard metal into the tool joint steel rather than binding the hard metal onto the surface of the tool joint.

The application of the hard metal with the new method is done by an automatic electric welding machine utilizing an inert arc process. Using a non-consumable electrode, an electric arc melts the tool joint steel into a puddle at the proper spot. Hard metal grains are fed into the puddle automatically. The arc is shielded by a continuous flow of inert gas to prevent contamination or oxidation of the steel during the melting process.

Unretouched photo of Inarclad cross section sample.

### ADVANTAGES

1. Inarclad uses the high alloy steel of the tool joint itself as the binder for the hard metal. Reduces chances of spalling or flaking!
2. The steel of the tool joint will not become oxidized by the heat of the weld because the arc is operating in an inert atmosphere.
3. The weld is made by an automatic machine which eliminates human errors. Superior weld quality!
4. Reedite is fed into the weld by machine, thus giving a better distribution of hard metal throughout the band. Uniform, measured amount of hard metal is put into each band!
5. The hard metal is distributed uniformly in depth through the band. This assures that a uniform number of hard metal grains are always resisting abrasive wear until the hard metal is worn completely away. Uniform wear rates!
6. The hard metal bands have a concentration of hard metal approaching that of Surface Concentration method and equal the depth of Deep Penetration method. More hard metal!
7. The hard metal is applied to the tool joint without recessing and results in a slight surface build up. This build up equals approximately 1/32 in., which increases the tool joint O.D. about 1/16 in. The O.D. of the tool joint remaining after all the hard metal has worn away is 1/16 in. larger than it would be if the same bands had been laid in recesses.

**REED** **leadership in tool joint design.**

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# International News and Notes

## New Japanese Petrochemical Plant

A phenol plant is to be built by Stone & Webster Engineering Corp. for Mitsui Petrochemical Industries, Ltd. This will be the first large scale phenol plant in the Eastern Hemisphere and will form one of the major components of the petrochemical facilities being installed at Iwakuni City, Japan. The corporation is also designing for Mitsui another major processing unit which will produce a wide range of valuable products including propylene and high purity ethylene.

An ethylene plant for Sumitomo Chemical Company, Ltd. and isopropyl alcohol and acetone unit for Nippon Petrochemicals Co., Ltd., are also being built by Stone & Webster Engineering Corp.

## Yugoslavs Explore in Syria

A group of Yugoslav oil experts are reported in Syria since April, 1956, to carry out geological tests and exploratory drilling for oil. The exploration work of the Yugoslavs, who are using Austrian and Soviet equipment, will be reportedly conducted throughout the entire country.

Western diplomats reported from Belgrade that Soviet turbodrills, produced under license by Mannesmann-Trauzl A.G. in Austria, have been delivered to the Yugoslavs to Syria. The Soviet Union has not yet protested the re-selling of Austrian turbodrills by Yugoslavia to the Near East.


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## French Refinery Plans

The Chamber of Commerce of Strasbourg, France, is talking up a new petroleum refinery for its area, both with the French government and oil companies. The chamber is studying plans drawn up by the Pechelbronn Oil Co., calling for a plant to handle 4 to 7.4 million tons a year (80,000—148,000 b/d) of which 71% would be combustible fuels.

The plant would cost 25 billion francs ($71.4 million) at the lower capacity, or 6,000 francs per ton ($2.28 per barrel); it would cost 37.5 billion francs ($107 million) at the larger capacity or 5,000 francs per ton ($1.90 per barrel).

The plan calls for a crude oil pipe line of 750 kilometers (450 miles) from Lavera, near the port of Marseilles, which would cost 16.7 billion francs ($47.7 million) and carry 4 million tons of crude oil yearly.

The line would cost 18.2 billion francs ($52 million) if designed for 7.5 million tons (150,000 b/d) and would bring in crude at less cost than tanker hauls from the Mediterrean Sea to the North Sea. Later, the plan says, the line could be extended to Cologne. Winds will blow away fumes from the city area of Strasbourg, the plan says.

## Expansion Forecast In German Refining Consumption

Western Germany will nearly double petroleum consumption, from 13,023,000 metric tons of petroleum in 1956 to 23,533,000 tons by 1961. The growth is illustrated in the following table:

*ESTIMATED OIL COMSUMPTION IN WESTERN GERMANY*

(Thousands of Metric Tons)

| | *1956* | *1957* | *1961* |
|---|---|---|---|
| Gasoline | 3,000 | 3,300 | 4,200 |
| Diesel oil | 3,300 | 3,550 | 4,300 |
| Heavy fuel oil | 3,200 | 5,100 | 8,100 |
| Medium fuel oil | 300 | 500 | 1,100 |
| Light fuel oil | 1,000 | 1,400 | 2,800 |
| Lube oils | 525 | 555 | 655 |
| Total | 13,023 | 16,263 | 23,533 |

To meet the demand, Esso A.G. has started construction of a new refinery near Cologne which will concentrate on output of fuel oil. Deutsche Shell A.G. has brought 370 acres near Hamburg-Harburg and plans to erect a refinery concentrating on motor gasoline. The refinery, which is expected to be in use by 1958, is to have a capacity of 2,500,000 tons a year crude throughout. Caltex officials say they are considering a new plant, and other companies are showing interest, according to reports.

During 1955, total energy requirements of Western Germany came to 171 million ton units of coal, of which 91% came from coal and lignite, and 7% from oils.

The 1955 drilling program in Western Germany last year added up to 734,273 meters of depth a gain of 11.6% over the year before, but short of the target of 800,000 meters.

Proved reserves at the start of this year stood at 49,100,000 tons compared with 47,400,000 a year earlier. Probable reserves stood at an additional 16,000,000 tons at the start of this year, compared with 17,900,000 a year earlier. This was after 1955 crude oil production of 3,147,214 tons, up 18% from the 2,660,000 tons of 1954.

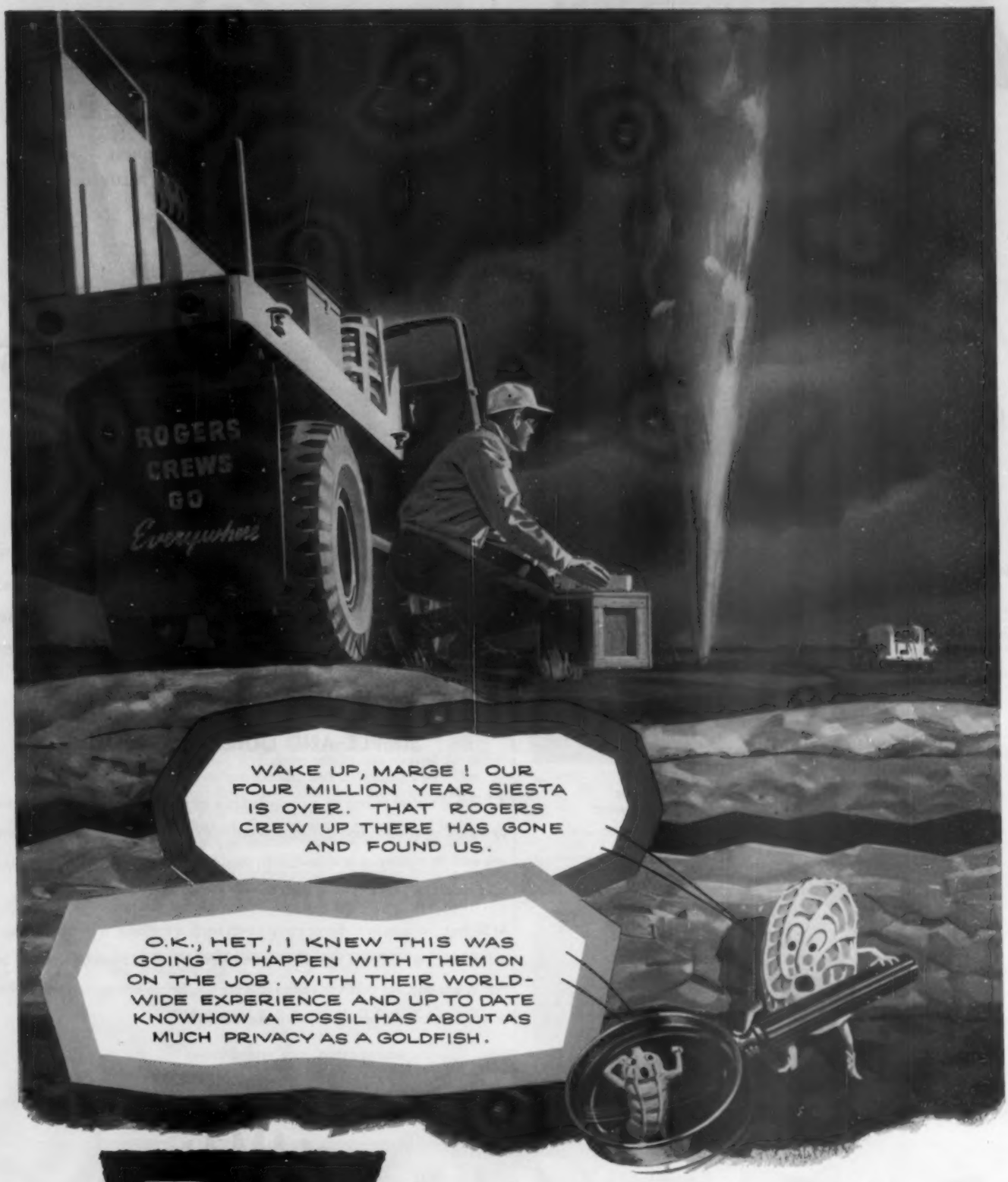
## New Papua Wildcat

Australasian Petroleum Proprietary, Ltd. has cemented 18⅝ inch casing to 563 feet on Kuru No. 2 in Papua (New Guinea). Kuru No. 2 well is near to and a replacement for Kuru No. 1 which has now been sealed with cement after a gas blow-out at 998 feet. Another rig is being set up at Barikewa, in the same general area as Kuru.

## Accelerator Used In France

Cie Francaise de Raffinage has announced purchase of a 2-million-volt Van de Graaff particle accelerator for basic research from High Voltage Engineering Corp., U.S. The Van de Graaff accelerator will be used in fundamental research studies relating to effect of radiation on the organization's line of petroleum products.

(*Continued on page* 142)


ROGERS
CREWS
GO
Everywhere
WAKE UP, MARGE ! OUR FOUR MILLION YEAR SIESTA IS OVER. THAT ROGERS CREW UP THERE HAS GONE AND FOUND US.
O.K., HET, I KNEW THIS WAS GOING TO HAPPEN WITH THEM ON ON THE JOB. WITH THEIR WORLD-WIDE EXPERIENCE AND UP TO DATE KNOWHOW A FOSSIL HAS ABOUT AS MUCH PRIVACY AS A GOLDFISH.

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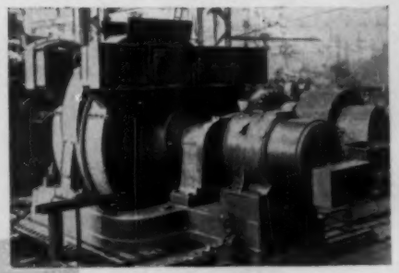
Below are shown three typical aspects of VOKES protection . . . protection which cannot be jeopardized by the non-availability of element replacements because VOKES FILTERS ARE CLEANABLE.

***MICRO-VEE PANEL FILTERS FOR ELECTRIC MOTORS***

Electric motors breathe too . . . and these VOKES filters have proved conspicuously successful in preventing the grave damage hitherto sustained during operations in impure air conditions.



***VOKES FILTERS FOR ANCILLARY EQUIPMENT***

Compressors . . . portable generators . . . welding sets . . . power packs . . . all need protection against the ingress of abrasive dust, whether by air-intake, lubricating oil or fuel.

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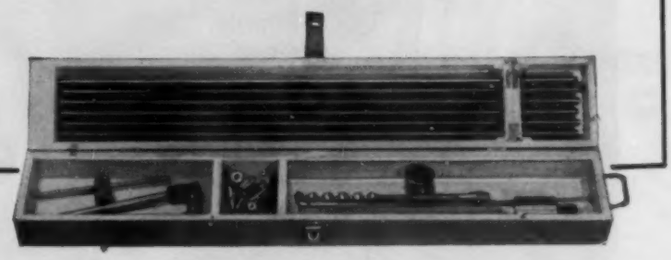

**Specifications**—Net weight of tools 54 lbs.; Weight of case with tools 84 lbs.; Shipping weight 107 lbs.; Size of case 4 ft. 5 ins. x 11 ins. x 8 ins.

The Mackintosh boring and prospecting tool is neatly packed, easily operated and transported by one man. Simple, reliable and efficient, with nothing to go wrong, it is suitable for many purposes and is supplied in hundreds to Oil Companies, Foreign Governments and Colonial Authorities.

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A 1-inch dia. steel driving bit is connected to a set of 4-foot, ½-inch dia. steel rods. By means of a tripod and driving arm arrangement, the bit is easily hand-driven into such formations as brick-dust, clay, sand, alluvium etc., up to the hardness of solid chalk.

At 50 feet, the area in frictional contact with earth is still only ⅛ of that of a plain rod or "bulling-iron" at 4 feet. 20 or more holes 30 feet deep can be made by one man in one day. No debris or earth-spoils are left. Simple attachments enable core or water samples to be taken quickly and accurately.

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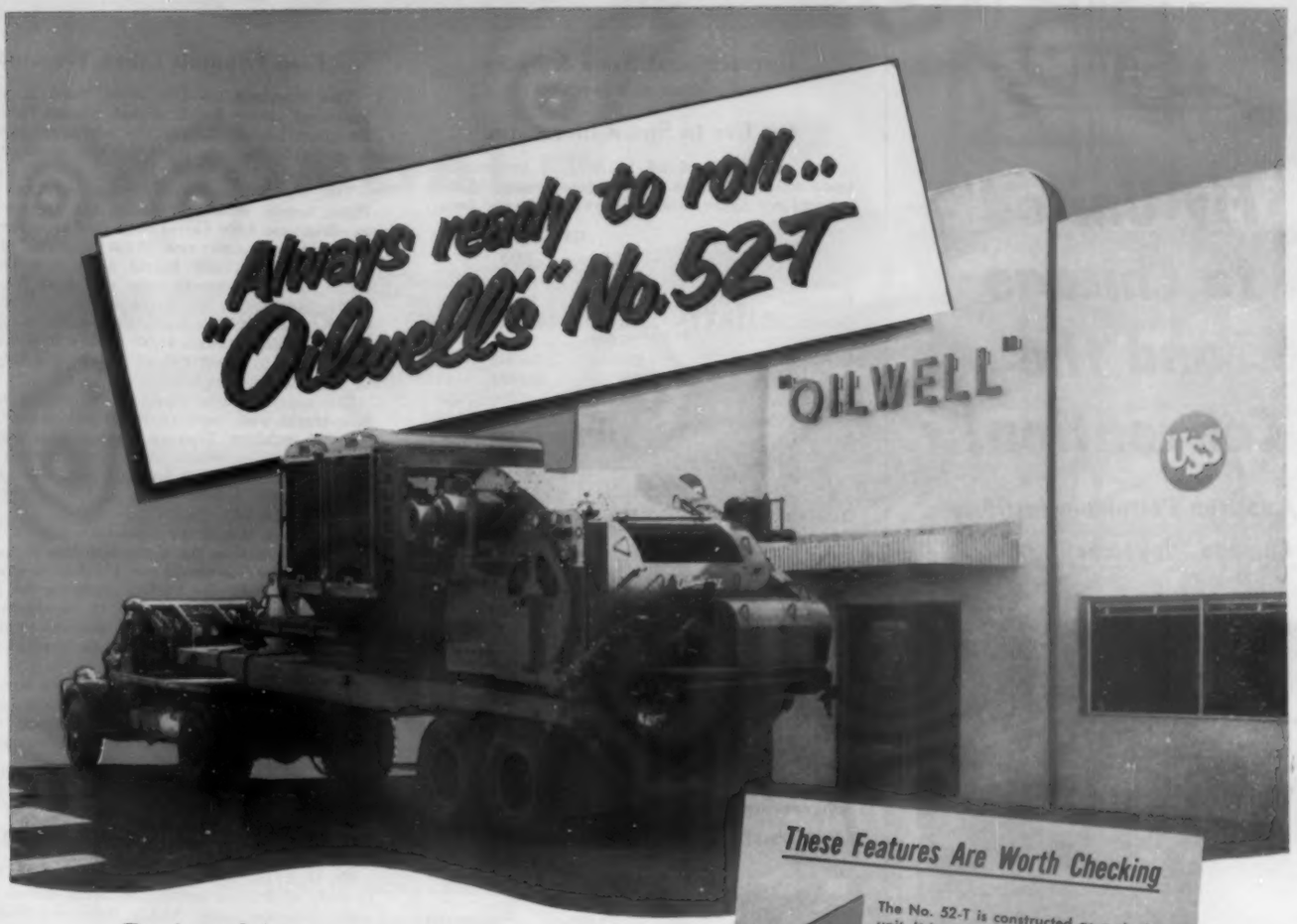


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**TRAILER MOUNTING OR REGULAR SKID-TYPE RIGS... DRILLING AND DEEP-WELL WORK-OVER**

PORTABILITY is the key word for this No. 52-T Rig. Engine, drive, and draw works are moved as a single unit to reduce loading and unloading time. The rig is ready to drill when it reaches the drilling site, and costly rig-up time is reduced.

When desired, the engine can be removed to reduce the weight or overall width of the unit to meet field conditions.

The No. 52-T is designed for regular drilling to 6,000 feet with 4½-inch drill pipe . . . well servicing, and work-over operations to 12,000 feet with drill tubing.

Your "Oilwell" representative will be glad to furnish detailed performance and engineering data on the No. 52-T rig.

## These Features Are Worth Checking

**UNITIZED SKID BASE** — The No. 52-T is constructed as a single unit. It is mounted on a rigid, skid base that is extended, for the integral mounting of the prime mover.

**FINGER-TIP CONTROL** — From the conveniently located control panel, the driller has complete control of the No. 52-T. Oil-pressure gauge, transmission tachometer, air-supply-pressure gauge and torque converter pressure and temperature gauges are mounted on this panel.

**1 OR 2 ENGINE DRIVE** — The drive is an integral part of the draw works, and can accommodate one or two engines developing 250-350 hp.

**TORQUE CONVERTER** — The torque converter is mounted in the draw works permitting a wide choice of prime movers. It can be removed from the draw works when engines with converters are to be used. The transmission is also built-in and has hi, lo, and reverse hoisting speeds and two forward and one reverse rotary speeds.

"OILWELL" No 212-P or No. 214-P Slush Pumps, No. 250 Crown Block (250-Ton Rating), 66-inch Traveling Block (4 Sheaves, 200-Ton Rating) and the 17½ C Rotary (200-Ton Rating) are companion equipment for the No. 52-T.

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## International News & Notes

(*Continued from page* 138)

### Oil Use In Spain Increasing

The movement of oil in Spanish international trade reflects Spanish consumption trends. Spanish government figures are as follows (in metric tons):

IMPORTS

| | *1954* | *1955* | % |
|---|---|---|---|
| Gasoline | 121,346 | 65,218 | —46.3 |
| Kerosine | 42,981 | 66,145 | +53.9 |
| Diesel | 1,029,448 | 408,094 | —60.4 |
| Lubes | 75,590 | 71,819 | — 5 |
| Crude | 2,590,668 | 2,785,948 | + 7.5 |
| Fuel oil | 936,068 | 694,498 | —25.3 |
| Asphalt | 4,855 | 3,400 | —30 |
| Vaseline | 640 | 1,110 | +73.4 |
| Paraffin | 1,770 | 1,541 | —12.9 |

EXPORTS

| | *1954* | *1955* | % |
|---|---|---|---|
| Gasoline | 51,359 | 70,821 | +52.3 |
| Kerosine | 24,938 | 24,363 | — 2.3 |
| Diesel | 1,150,302 | 704,872 | —38.7 |
| Lubes | 354 | 341 | — |
| Crude | 1,171 | — | — |
| Fuel oil | 867,624 | 242,398 | —72 |
| Asphalt | 360 | 308 | —14.5 |
| Vaseline | — | — | — |
| Paraffin | — | — | — |

### Rise In Netherlands Refining Runs

Refinery runs in the Netherlands climbed 16.1% in 1955 over 1954.

Figures are as follows:

*RUNS TO STILLS IN NETHERLANDS—1954, 1955*
(Metric tons)

| | *1955* | *1954* |
|---|---|---|
| Motor gasoline | 2,378,000 | 2,427,000 |
| Mineral turpentine | 15,000 | 15,000 |
| Kerosine | 732,000 | 624,000 |
| Gas oil, diesel | 2,671,000 | 2,367,000 |
| Fuel oils | 5,303,000 | 4,230,000 |
| Lube oils | 68,000 | 37,000 |
| Bitumen | 309,000 | 281,000 |
| | 11,476,000 (229,520 b/d) | 9,881,000 (197,620 b/d) |


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### Esso Expands Libya Terminal

Esso Standard Oil Co. (Near East) is planning improved tanker handling and storage facilities at Benghazi harbor, Libya. The company expects to have the facilities in operation this summer, probably in July, 1956.

The terminal product storage consists of two 15,000 barrel cone roof tanks, for regular motor gasoline; one 5,000 barrel cone roof tank for premium motor gasoline; one 10,000 cone roof tank for kerosine; one 15,000 barrel cone roof tank for diesel; one 7,500 barrel cone roof tank for diesel.

The storage is being placed on 15,000 square meters of 67,000 square meters bought by Esso at Juliana Mole, of which 15,000 square meters may be transferred to Shell Co. of Libya which plans a terminal to be completed in 1957.

Esso plans a single two-position loading rack for tank trucks with capacity of 200 gallons per minute for each product. Tankers coming in will use the present facilities, which consist of a floating eight-inch pipe line running to fixed eight and six inch lines of eight kilometers to the British Military Petroleum Depot.

Esso plans to add an eight-inch pipe line from a booster station on the eight-inch line to the British depot. The line would run 150 meters. Presently, high winds make the harbor unusable for loading or unloading tankers, except in emergencies, in other than the months of May through September. Top capacity of tankers that can be handled is 5,000 tons.

The British depot, leased from Libya until 1958, is in poor condition, and the tank leakage is high. The capacity is 125,000 barrels of storage, including five above ground tanks of 10,000 barrels each; one underground of 27,000 barrels; and one underground of 48,000 barrels.

### Drilling For Steam In New Zealand

Mr. McMillan and J. H. Smith have visited Borneo to study oil drilling techniques, which march closely with the methods employed in their own drilling for live steam in New Zealand.

A belt of thermal activity runs for about 150 miles in a north-easterly direction from the center of New Zealand's North Island. Wairakei steam field lies in a comparatively desolate part of this region. The field itself occupied about three square miles, and another 13 square miles nearby is under exploration. Wairakei has 42 "steam wells," most of them drilled to about 2,000 feet. Live steam at between 70 and 200 pounds per square inch is produced from 26 of the wells.

The steam is being blown off to atmosphere at present, but 20-inch pipelines are being laid to connect Wairakei with the banks of the Waikato River, about two miles distant, where foundations are being laid for a 70,000 k.w. power plant. Steam from Wairakei field will drive turbo-generators to feed current into New Zealand's grid, and if exploration in the steam field lives up to early promises, ultimate generating capacity will probably be 200,000 k.w.

Steam-drilling operations are carried out with trailer-mounted Ideal T.12 rigs. Field staff is about 150, plus 2,000 contractors' men engaged on the pipeline laying and power plant building.

Wairakei is New Zealand's most developed steam field. Another is being developed at Te Keto, 100 miles north of Wairakei, where the steam is wanted both for producing electric power and for direct use in processing paper pulp. Exploration for new steam sources is also taking place at Waiotapu, about 30 miles north of Wairakei.

### Reiter-Foster To Explore In Italy

A series of conferences with Italian government officials relating to oil concessions in Italy, has been scheduled by Alfons B. Landa, chairman of Reiter-Foster Oil Corp., New York.

Mr. Landa said he is seeking clarification of proposed legislation which will affect producers seeking oil concessions in Italy and that in line with its expansion policy, Reiter-Foster is interested in exploring foreign oil fields. The firm, an oil producer for more than 30 years, now has interests in 150 domestic wells.

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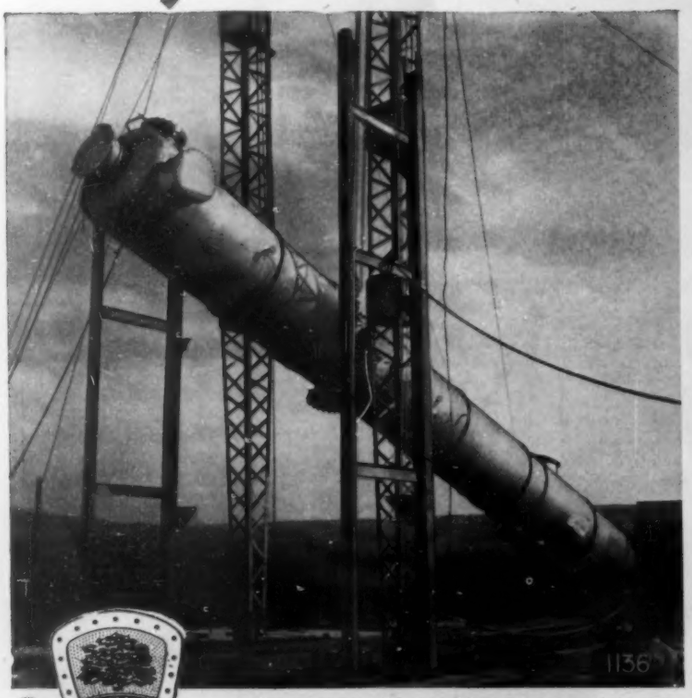

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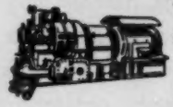

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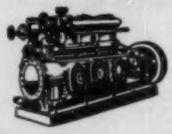

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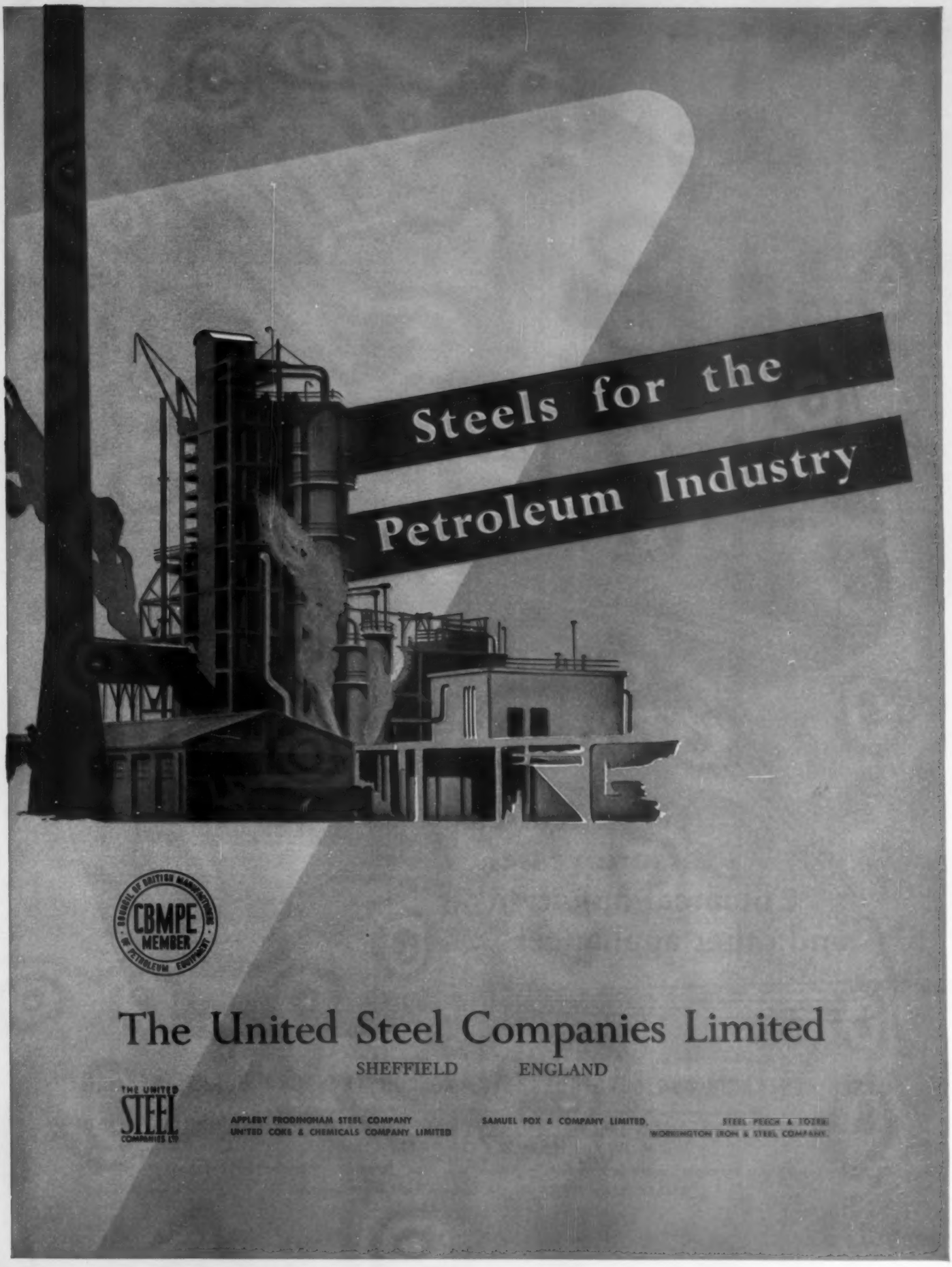
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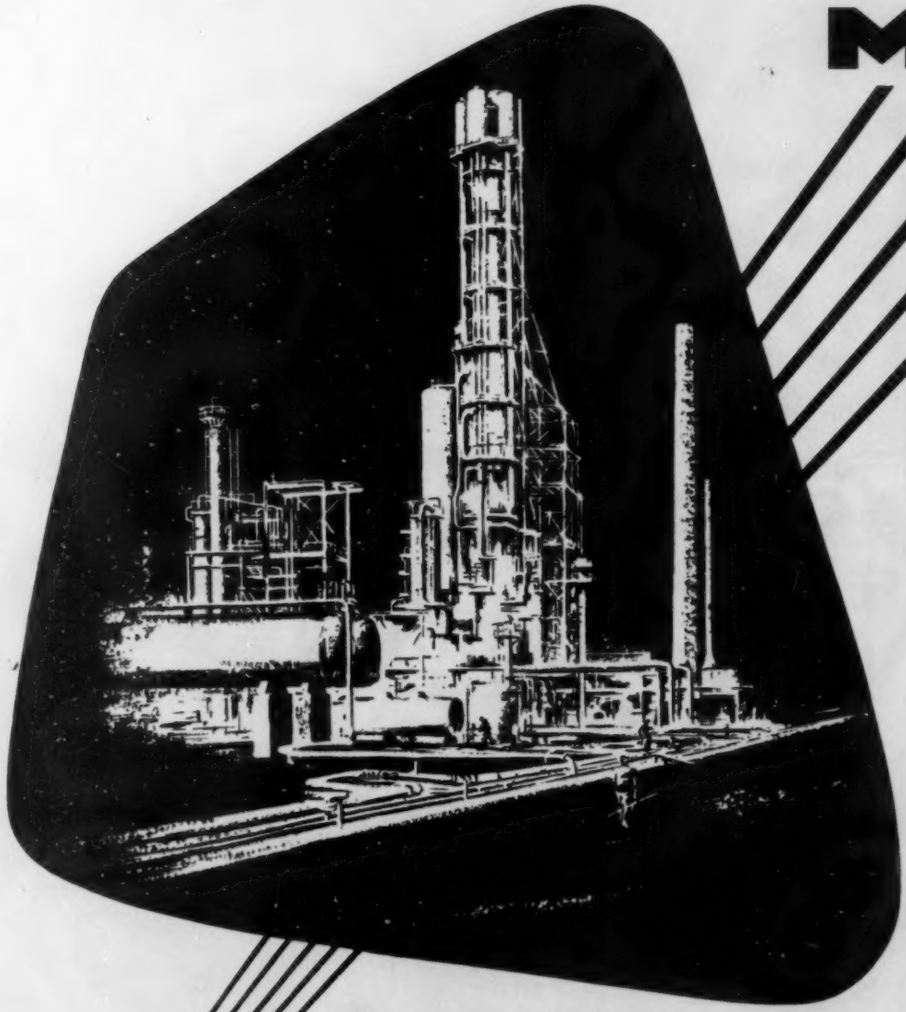

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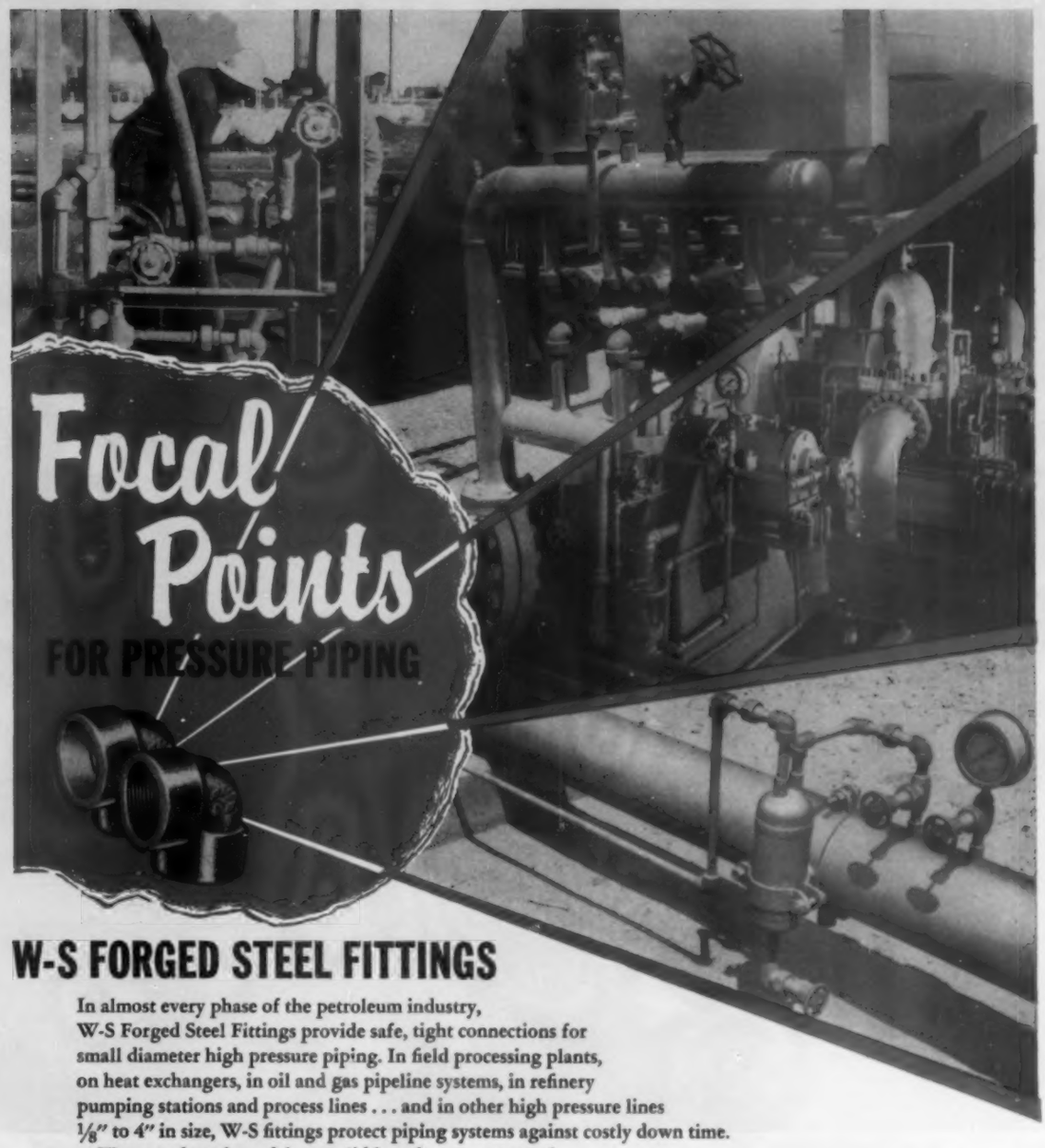


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*— M. J. Rathbone, President, Standard Oil Company (New Jersey)*

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The Champlin unit is one of seventeen Orthoflow Fluid Cat Crackers engineered or erected by The M. W. Kellogg Company for leading refiners throughout the world, with throughput capacities ranging from 3,500 BPD to 102,000 BPD. The trend toward this vertical-design cat cracker is graphically explained in a full-color, 15-minute animated movie. Refiners interested in seeing this film in their offices can make arrangements by contacting M. W. Kellogg.

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## UOP Appropriates Funds

Over $1,000,000 has been appropriated by the board of Universal Oil Products Co. to improve existing facilities and construct new processing equipment for development work as well as manufacturing.

Most of the amount appropriated will be spent on facilities in the company's Chicago area locations at McCook and Riverside. A sizeable sum would go for a new addition to the company's Shreveport, La., manufacturing plant.

## Sinclair To Buy Southern Production

Assets of Southern Production Co., Fort Worth, will be purchased by Sinclair Oil Corp., if a recent tentative agreement between the two companies is rectified by stockholders. The deal involves 49 million barrels of crude reserves, substantial gas properties, interests in pipe lines and a refinery. Sinclair would also obtain an option to buy 850,000 shares of Canadian Atlantic Oil Co., Ltd. The sale of producing properties would be subject to a reserved production payment of $65 million to be liquidated over 10 years but which would not be a Sinclair obligation.

## Farm Expenditures for Oil

Expenditures for gasoline and other petroleum fuel and oil by farmers in 1954 totaled more than $1,364,000,000 according to figures from the 1954 Census of Agriculture. These expenditures were equivalent to $418 for each farm in the United States in 1954. Farmers' expenditures for gasoline and other petroleum fuel and oil amounted to $1,132,-612,502 in 1949, or an average of $380 per farm.

The figures on expenditures for gasoline and other petroleum fuel and oil included gasoline, oil and other petroleum products for use both on and off the farm for tractors, motortrucks, and for the farmer's automobile for the farm business, but not for personal purposes.

*Snapped at a recent cocktail party in Paris. Left to right: J. B. O'Connor, executive vice president Dresser Industries, Inc.; M. Biesel, research engineer, Etablissements Neyrpic, Grenoble; M. Caron, Socabo Co., Paris (Esso Standard Francaise subsidiary producing synthetic rubber); R. J. Stallara —Edeco Rockbits, Ltd., London; M. Emmanvelli, president, S. N. MAREP, Paris; Mike Galpin, European manager, Clark Bros. Co., London.*

## New Sales Head For South Chester Tube Co.

Francis H. Gibson has been elected vice president of sales of the South Chester Tube Co., Chester Pa. Mr. Gibson joined the South Chester Tube Co. in 1927. He is the third generation of his family to serve with the company.

## Texaco Enters Uranium Field

The Texas Co. and the New Jersey Zinc Co. have jointly purchased the Happy Jack Mine in Utah from the Bronson and Cooper Mining Co. of Montecello, Utah, through the Texas Zinc Minerals Corp.

The companies will also construct a uranium processing mill at Mexican Hat, Utah.

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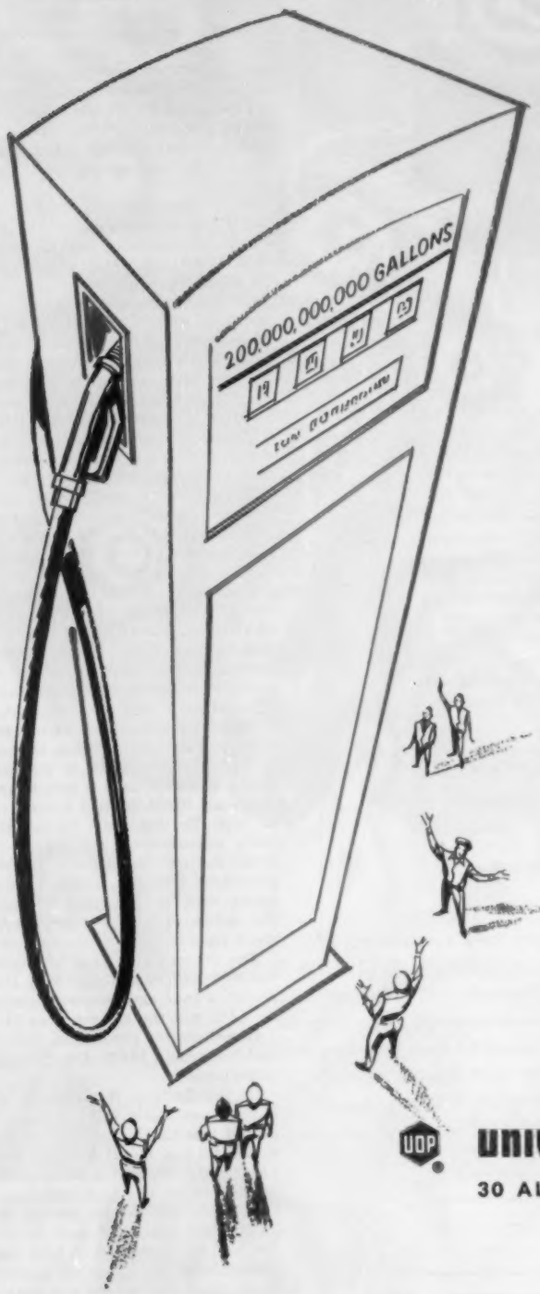


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Diameter of common hole sizes drilled_____
Types of bits commonly used_____
Depth of holes drilled_____
Make and model of rig or drill_____
Size drill pipe_____ Name of thread_____
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## World Petroleum Consumption Expands

*(Continued from page 57)*

Despite the improvement in demand the Eastern Hemisphere has enjoyed an even more rapid increase in production of petroleum. In 1955 the Eastern Hemisphere produced almost as much oil as it consumed. Traditionally the east has depended on the Americas to supply its shortage of oil but last year exports to the west were almost as great as imports from the west.

Eastern Hemisphere production of crude oil averaged 5,449,000 b/d in 1955 and natural gas liquid added another 155,000 b/d bringing total petroleum production to 5,604,000 b/d. This compares with a consumption of 5,780,000 b/d.

An accompanying flow diagram shows the volume of intercontinental shipments in 1955. Major movements from west to east totaled about 715,000 b/d during the year while the East shipped 400,000 b/d to the Western Hemisphere.

Within the Eastern Hemisphere by far the greatest movement of oil was from the Middle East to Europe. In 1955 this averaged about 1,880,000 b/d compared with 1,750,000 b/d in 1954. Shipments to eastern Asia and the Pacific averaged a half million b/d. Africa received 275,000 b/d of Middle East oil of which 100,000 b/d was first shipped to European refineries for processing and later re-exported to Africa.

Major exporting countries of Latin America continued to expand their markets in North America and to the southern part of their own continent in 1955. More than a million b/d was shipped from the Caribbean to North America and 400,000 b/d to other South American countries. Europe received about 450,000 b/d and Africa 85,000 b/d while minor amounts moved westward across the Pacific. Venezuela had a net exportable surplus of 2,036,500 b/d in 1955, compared with 1,794,600 b/d the previous year. This compares with an exportable surplus of 2,900,000 b/d from the Middle East.

World production of crude oil, condensates and other natural gas liquids averaging 16,270,000 b/d, was somewhat greater in 1955 than consumption causing a continued rise in above ground stocks. Increase during the year was about 73 million barrels compared with 42 million barrels in 1954. A considerable portion of the growth was required to maintain adequate working stocks in view of the considerable expansion in trading. Economists of British Petroleum Co. have ascertained that 37.5% of all oil consumed in the world moves to market in international trade—mostly by water. When coastal domestic movement is added 40% more of the world's oil moves by water. Each year the volume of oil afloat at any one time tends to increase.

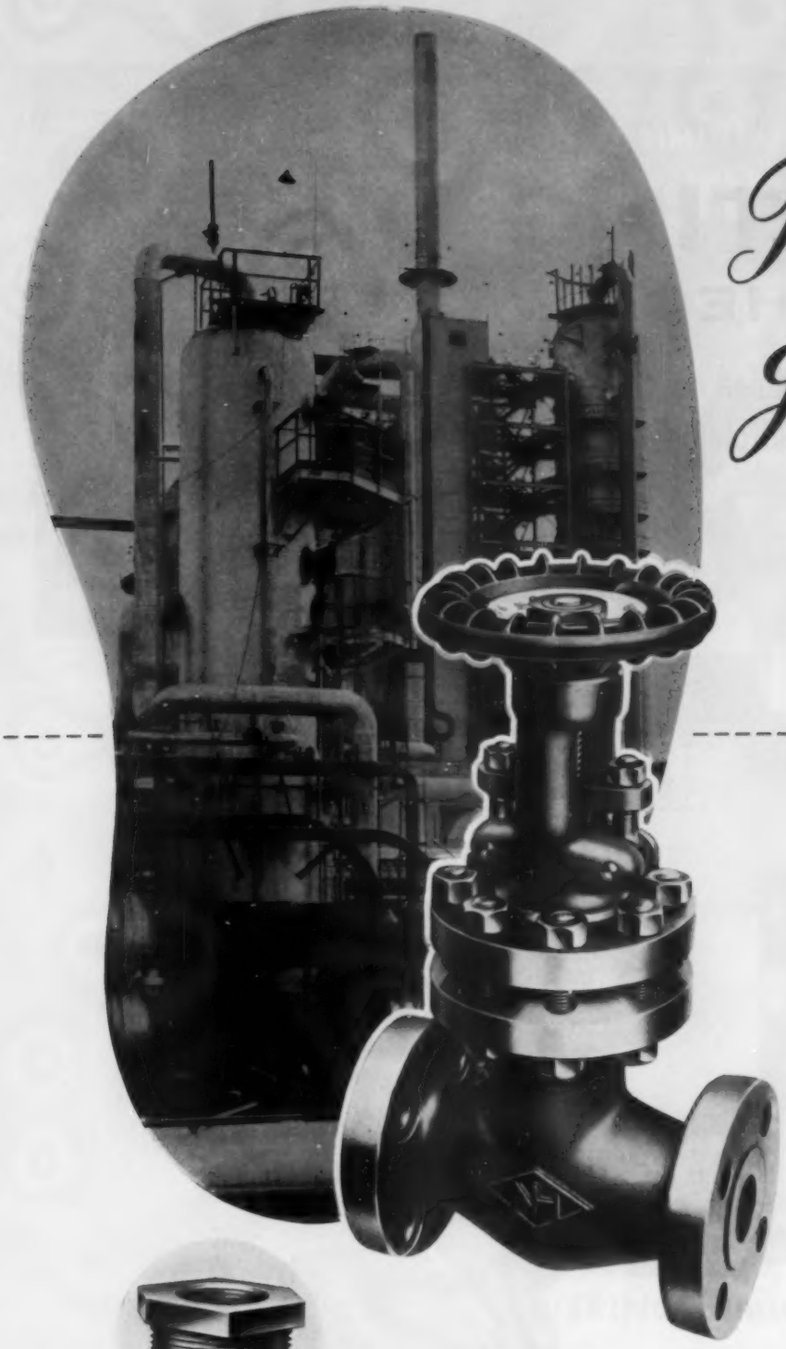
Based on operations during the first half of the present year, the addition to stock will be greater in 1956 than in either of the preceding two years.

In a global basis it is noted that crude production averaged 16,592,000 b/d during the first six months of 1956. To this must be added a million barrels daily representing the supply of condensate and other natural gas liquids. Total world supply of petroleum thus was about 17,592,000 b/d. This compares with an indicated average for demand for the entire year of 17,295,000 b/d, and indicates a stock accumulation at the rate of about 300,000 b/d.

The increase in global production of crude oil in the first half of the year was 11.3% over the same period a year ago. Western hemisphere output was up 7.6% and the eastern area 18.4%.

United States production rose 5.2%, Canada 36% and Venezuela 10.6%. Other changes were of lesser importance.

In the Eastern Hemisphere, Middle East crude output was 14.3% higher than a year ago. Iranian output was nearly doubled, rising from 210,000 b/d to 502,000 b/d. Saudi Arabian production was 96,000 b/d higher, Kuwait 8,000 b/d and Iraq 47,000 b/d greater. In the Far East, Indonesia continued to produce more oil, output during the first half being 256,000 b/d compared with 241,000 b/d a year ago. The rise in production in both Eastern and Western Hemispheres is somewhat higher than the rise in demand anticipated for this year. This suggests that a correction will become necessary before too long. The required correction is not great when compared with the total international trade—allowing for necessary increases in transit and other working stocks, it may not greatly exceed 1% of current output, not a great amount in a global operation the size of the petroleum industry. END



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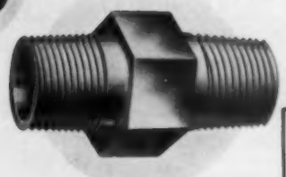

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# DOMINION TILTING DISC CHECK VALVES

## — range now extended to cover all requirements of the American Petroleum Institute, Standard 6D

The quality Check Valve for your service, in materials, sizes and the pressure range for your special requirements.

- LOW HEAD LOSS
- CANADIAN BUILT
- LONG OPERATING LIFE
- LOW MAINTENANCE COST
- BACKED BY 25 YEARS OF TILTING DISC CHECK VALVE MANUFACTURING EXPERIENCE

Dominion Tilting Disc Check Valves are being supplied for the 45,000 BBL per day Imperial Oil Refinery at Dartmouth, Nova Scotia.

*May we send you our Bulletin No. 211-P*

**DOMINION ENGINEERING**
COMPANY LIMITED
HYDRAULIC DIVISION
MONTREAL TORONTO WINNIPEG VANCOUVER

"We operators learned about SIMULTANEOUS LOGS the hard way

# ...SO TAKE A TIP FROM US"

**NOT Some Logs, in Some Places,**
**But ALL PGAC LOGS, EVERYWHERE—**
**ARE SIMULTANEOUS LOGS**
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PGAC developed the Industry's FIRST Simultaneous Logs.

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PGAC 561

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CALL FOR PROMPT SERVICE — ALWAYS READY TO SERVE YOU

TEXAS: Abilene — Alice — Beaumont — Bowie — Colorado City — Corpus Christi — Dallas — Fort Worth — Gainesville — Graham — Houston — Longview — Midland — Odessa — Pampa — Tyler — Victoria — Wichita Falls.
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LOUISIANA: Houma — Lafayette — Lake Charles — Shreveport. KANSAS: Great Bend — Liberal. NEW MEXICO: Hobbs.

AFFILIATE COMPANIES: CANADA — Perforating Guns of Canada, Ltd., Edmonton, Alberta
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*J. L. Vint, Jr.*

*J. W. Tullis*

## New Appointments At Unit Rig

J. L. Vint, Jr. has been elected president of Unit Rig & Equipment Co. J. W. Tullis has been named executive vice president.

## Non Lubricated Bearing

A development that may eliminate the need for conventional lubrication in many types of bearings has been announced by E. I. du Pot de Nemours and Co. "Teflon" (tetrafluorethylene) fiber woven into fabric is used to face metal automobile suspension joints. In addition to functioning without customary lubrication the fabric reduces the amount of friction by more than 50% in comparison with standard lubricated suspension joints used in today's automobiles. Developer of this use for "Teflon" fiber is the American Metal Products Co. of Detroit.

## Appointed V. Pres. & Gen. Mgr.

Jack W. Hudson, former general superintendent of Deep Rock Oil Corp., Tulsa, and more recently consultant in Denver, has been appointed vice president and general manager of Tri-Province Drilling Co., Ltd., with offices in Calgary.

## New UOP Director

Bert R. Prall has been elected a director of Universal Oil Products Co.

## To Study Big Business

A Senate Democrat is working up a new study of business concentration, timed for publication just before the elections in November.

Sen. Joseph C. O'Mahoney, D., Wyo., has asked the U. S. Census Bureau to make nine special studies on concentration for him based on its new census figures.

## New Tax Ruling on Oil Leases

The U. S. tax collector seems to have a double standard when it comes to taxing oil producers. Under a new ruling, the first year rental for a non-competitive government oil and gas lease is an expense deduction for income tax purposes. But the rental payments for private, non-government oil and gas leases, continue to be regarded as a capital investment, recoverable only through depletion.

## Texaco Jet Fuels Laboratory

The new Texas Co.'s $250,000 laboratory, which took a year to complete, is believed to be the first company-financed installation in the petroleum industry capable of testing jet fuels in full-scale combustors. Equipment consists of three air compressors with a total of 1,800 hp, a gas-fired air heater, test stands for three full-scale aircraft gas turbine burners, special exhaust silencers, and the associated controls and instruments needed to carry out tests and record data.

Air entering the three-stage compressor can be compressed to the equivalent of twenty atmospheres. This is sufficient to duplicate aircraft gas turbine operating conditions of flight speeds in excess of 1,000 mph and altitudes of as much as 100,000 feet. The gas-fired air heater reproduces the heat found at the jet engine's burner input during the foregoing flight conditions. The heater can generate up to 3,000,000 Btu's per hour. Tall exhaust silencers outside the laboratory building reduce the noise from the burner tests to a level comparable to that of the ordinary sounds in the test area.

*J. T. Tucker*

## Tucker Joins Cardwell Manufacturing

J. T. Tucker has been appointed general manager of sales for Cardwell Manufacturing Co. Mr. Tucker is well known for his sales work in major oilfields throughout South and Central America, Canada, and in the United States. Cardwell was recently purchased by John W. Mecom of Houston, Texas.

## Rhodesian Oil from Coal

Rhodesian Anglo-American Ltd. and Wankie Coal Co. have decided to finance a preliminary investigation into the possibility of the Lubimbi coalfield as a basis for setting up a large oil and allied chemical industry. The extractable coal is estimated at 80 million tons. German experts have reported the coal is suitable for gasification but the complete report on any industrial project will take about two years.


If it's a difficult non-ferrous casting—consult Birkett, Billington & Newton. On the right is an example of what they can do. It is one of a pair of housings for the driving shaft of an independently sprung wheel. To withstand severe shocks and stresses it was cast in high tensile manganese bronze and then precision-machined. Birkett, Billington & Newton have the facilities and knowledge to solve your non-ferrous casting problems—however difficult.

**What's yours?**

CASTINGS FROM A FEW OUNCES TO 10 TONS..

*in phosphor-bronze, gun-metal, aluminium-bronze, manganese-bronze and light alloys. Precision-machined bushes and bearings. Specialists in high-tensile aluminium bronze castings, centrifugal-cast wheel blanks, and chill-cast rods and tubes.*

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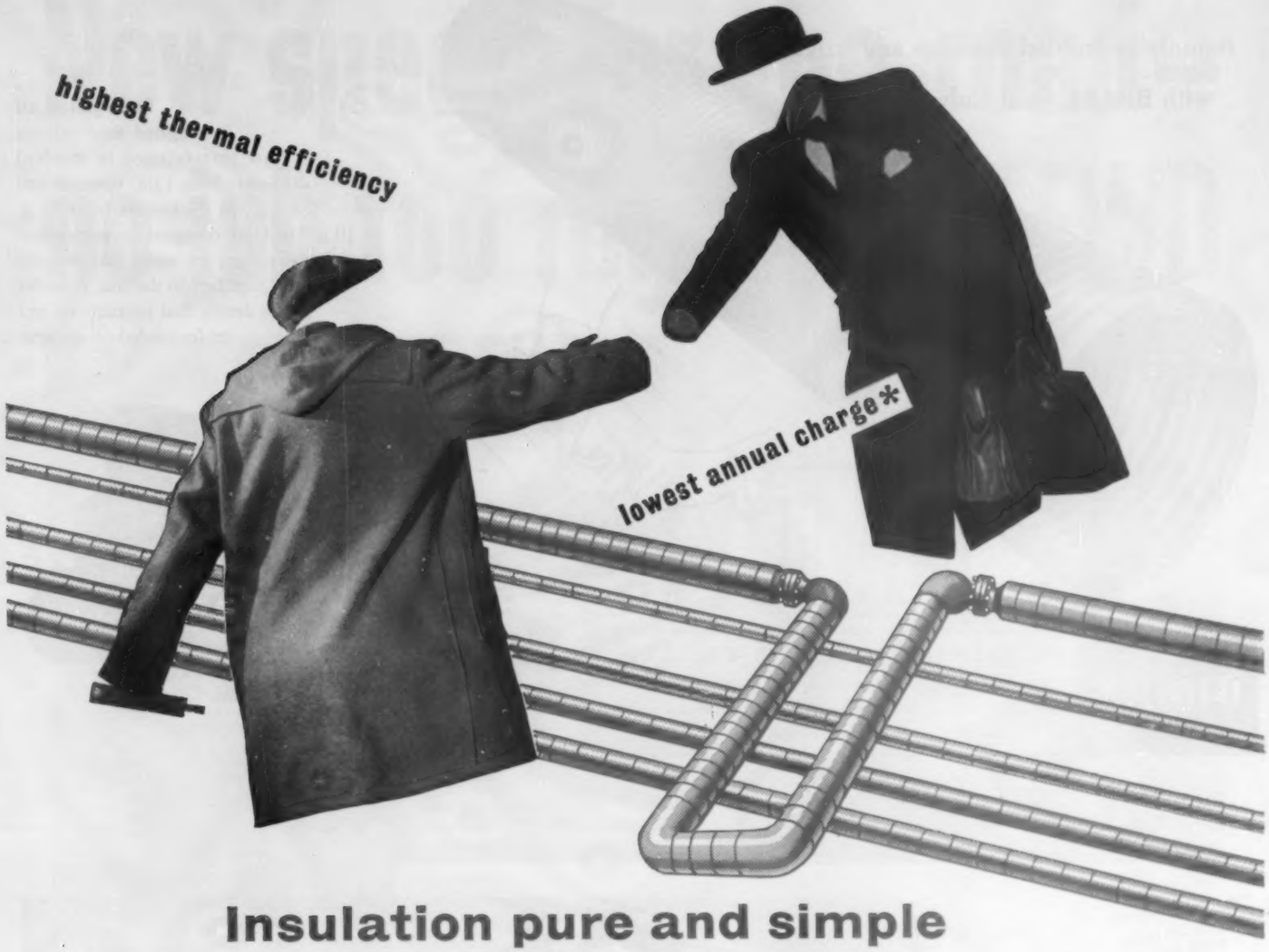
*One of Britain's Largest*

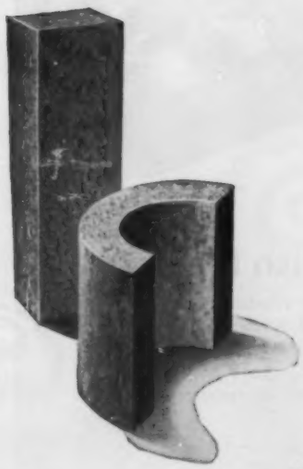
**NON-FERROUS**

*Foundries*




# Insulation pure and simple

To begin with CAPOSITE needs no undercoat for protection—even against 1000°F. What is more the CAPOSITE blocks and pipe sections can be applied to cold surfaces, with absolutely no mess! This saves you weeks of time, pounds of money. CAPOSITE is the thermal insulation material with not only the highest efficiency but also with the lowest annual charge.*



**CAPOSITE** REGD

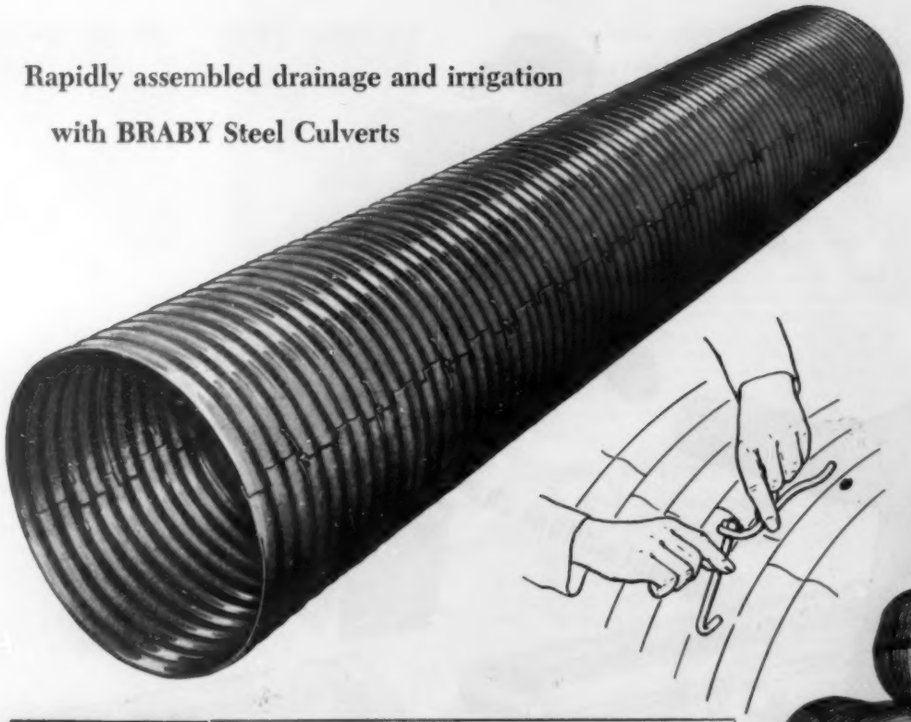
*Amosite Asbestos Blocks and Pipe Sections*

**Annual heat loss value plus financial depreciation.*

CAPE

**THE CAPE ASBESTOS COMPANY LTD.,** 114 & 116 Park Street, London, W.1. *GROsvenor 6022*
*Canadian Enquiries: CAPE ASBESTOS (CANADA) LTD., 200 Bloor Street East, Toronto, Ontario.*
*United States Enquiries: NORTH AMERICAN ASBESTOS CORP., Board of Trade Building, Chicago 4, Illinois.*

## Rapidly assembled drainage and irrigation with BRABY Steel Culverts



These galvanized corrugated steel culverts are manufactured in standard diameters from 12in. upwards and in thicknesses from 18 g. to 10 g. The Units designed for economical shipment, are easily and securely fitted together on the site. A leaflet with details and instructions will be forwarded on request.

ONE OF THE WIDE RANGE OF BRABY PRODUCTS

**FREDERICK BRABY & CO. LTD.**

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**HEAVY DUTY RING SPANNERS**
A formidable tool when used in conjunction with our special tubular handles.

**OPEN-ENDED PODGER SPANNERS**
In B.S.F., B.S.W., American A/F and Unified Hex. Sizes.

**SLOGGING RING SPANNERS**
Available in B.S.F., Whitworth, American A/F and Unified Hex. Sizes to suit all requirements.

**RING PODGER SPANNERS**
A heavy duty tool supplied in all sizes to meet your requirements.

**DOUBLE OFF-SET RING SPANNERS**
Forged in Chrome Vanadium Steel to withstand the hardest work.

**HEAVY DUTY RATCHETS**
Specially designed for Heavy Engineering purposes. 1" Square Drive with 30" long detachable handles and reversible mechanism.

AVAILABLE SIZES

| | Whitworth | American A/F |
|---|---|---|
| Ring Sloggers | $\frac{5}{16}$" – 2$\frac{1}{2}$" | 1$\frac{1}{16}$" – 3$\frac{1}{2}$" |
| Ring Podgers | $\frac{1}{4}$" – 1$\frac{1}{4}$" | $\frac{1}{4}$" – 2$\frac{1}{2}$" |
| Open Ended Podgers | $\frac{1}{4}$" – 1$\frac{1}{4}$" | $\frac{1}{4}$" – 2$\frac{1}{2}$" |
| D/O Ended Spanners | $\frac{1}{4}$" – 2" | $\frac{1}{4}$" – 3$\frac{1}{2}$" |
| Offset Ring Spanners | $\frac{1}{4}$" – 1$\frac{1}{8}$" | $\frac{5}{16}$" – 2$\frac{5}{16}$" |
| 1" Sq. drive Sockets | 1" – 2" | 1$\frac{1}{16}$" – 3$\frac{1}{4}$" |

## Equip with KING DICK

. . . for Pipe Line or Production Plant, the controlled precision and accuracy of KING DICK Hand Tools are essential to trouble-free maintenance work.
Fully illustrated catalogue, giving complete details of the KING DICK range of equipment, available on request.

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# New speed for the road— no job too rugged for FWD

When you pick a heavy-duty truck for today's oil operations you need a combination of speed and driving power—speed for increased highway travel and driving power for rugged off-highway hauling that is always a part of oilfield operations.

Today's big new line of FWDs is, more than ever, built for oil! The exclusive FWD power and weight proportioning; four or six wheel drive with the powered front axle; new engines with road speeds up to 65 MPH, with parts and service available anywhere . . . These are the features that give FWD versatility that takes oil jobs as they come!

Check the new line of FWD heavy-duty trucks built for well logging, cementing, petroleum transport, off-highway pipeline hauling and heavy equipment transport. They fit today's oil operations best!

FWD®

*Heavy-Duty Vehicle Specialists*

**THE FOUR WHEEL DRIVE AUTO COMPANY** • CLINTONVILLE, WISCONSIN • Canadian Factory: KITCHENER, ONTARIO

## New 100-Plus Octane Scale

Details of the new octane rating scale in the range from 100 to 120.3 will be announced to the industry on October 1 by William Gunn, secretary of the refining division of the American Petroleum Institute. The new scale was adopted by Committee D2 of the American Society for Testing Materials at its June meeting and will become effective as a tentative standard in June 1957. It will be put into use without delay by oil and automoti·e companies.

After lengthy debate the new scale adopted by the two industries is based on the Wiese formula developed by General Motors research laboratories which converts Army-Navy performance numbers into octane numbers in the area above 100. The formula is ON 100—PN-100/3.

As a practical matter octane numbers above 100 will be based on blends of IsoOctane and TEL. Isooctane plus 6 ml of lead will be 120.3 ON. Reference fuel preparation and test procedure data now is being prepared for the October 1 announcement. It is stated that the reference fuels will have the same values for both Motor and Research Methods. There will be some break in the size of octane number at 100 but the break will not be as severe as in some of the methods proposed during the debate prior to adoption.

## New Refinery Fabrication Service

Fritz W. Glitsch and Sons, Inc., Dallas, has announced a new specialty fabrication department for refineries and processing plants. The department will handle the design and fabrication of special kiln internals for cat-cracking units, reactor and regenerator beams and baffles, special piping, welding, steel components and other equipment which must be engineered for weight and strength ratios or special construction.

## Automatic Gas Analysis

Charles W. Skarstrom, an Esso Research and Engineering Co. physicist, has devised the first tailor-made chromatograph for use in automatic analysis of refinery gases. He combined the chromatograph —the 1906 invention of Michael Tswett now being "rediscovered" by engineers in the oil and chemical industries with a detecting principle he came up with three years ago to measure traces of water in hydrocarbon streams passing through refinery units.

One chromatograph is currently on trial at Esso's Bayway refinery, Linden, N. J. A second will be put in service soon. The instruments cost $12,000 each.

Development of the chromatography technique of automatically sampling gases stems from Esso Research's "control of processes" project. Periodic surveys are made of Standard refineries to determine the most pressing process control problems. Research men then try to solve the problem by supplying instruments that will do the job. From 1949 through 1953, the project supplied a total of 28 special plant instruments to various Esso refineries at an outlay of $300,000. These have saved an estimated $5 million in operating costs. In a chromatograph, steady flow of dry air propels samples of gas through 20-foot-long columns packed with activated alumina to effect a separation. The components (propane and propylene, mainly) then move through a small bed of activated carbon in which the different components give up different heats. The bed heats for only five seconds, then is cooled for a period of five seconds when fresh air flushes out the components. Data is electrically transmitted to a remote recorder in the unit control house.

## 20th International Geological Congress

A world symposium on petroleum and gas, at which 373 individuals and institutions from 112 countries have been invited to present papers, will highlight the 20th International Geological Congress to be held September 4 to 11 on the University City campus of the National University in Mexico City.

For the convenience of the 3,500 delegates expected to attend, six languages—Spanish, English, French, Italian, German and Russian—have been designated as "official," and the sessions have been broken down into the following sections:

"Cenozoic and Mesozoic Vulcanology of the Western Hemisphere and Their International Correlations"; "Relations between Tectonics and Sedimentation"; "Modern Ideas about the Origin of Mineral Deposits"; "Paleontology"; "Taxonomy and Evolution"; "Plutonic Rocks—Their Origin and Relations with Tectonics"; "Applied Geophysics"; "Micropaleontology"; "Petrology and Mineralogy"; "Geochemistry"; "Geochemical Exploration and Isotopic Geology"; "Genesis of Ancient and Modern Stone Roads"; "Geology as Applied to Engineering and Mining"; "Marine and Submarine Geology"; and "Various Problems of General Geology."

## Thiokol to Market Butyl Rubber

The Thiokol Chemical Corp. of Trenton, N.J., will market butyl rubber in collaboration with Petroleum Chemicals, Inc., a company jointly owned by Cities Service Co. and the Continental Oil Co. Petroleum Chemicals, Inc., operates a butadiene plant at Lake Charles, La. Thiokol is establishing a sales, research and development laboratory at its Trenton works to study and develop uses for Butyl rubber.

H.R.C. Cartridge Fuse Links
to B.S.S. 88-1952
A.S.T.A. certified for Category of Duty A.C5
(46,000 amperes prospective current at 550
volts.)
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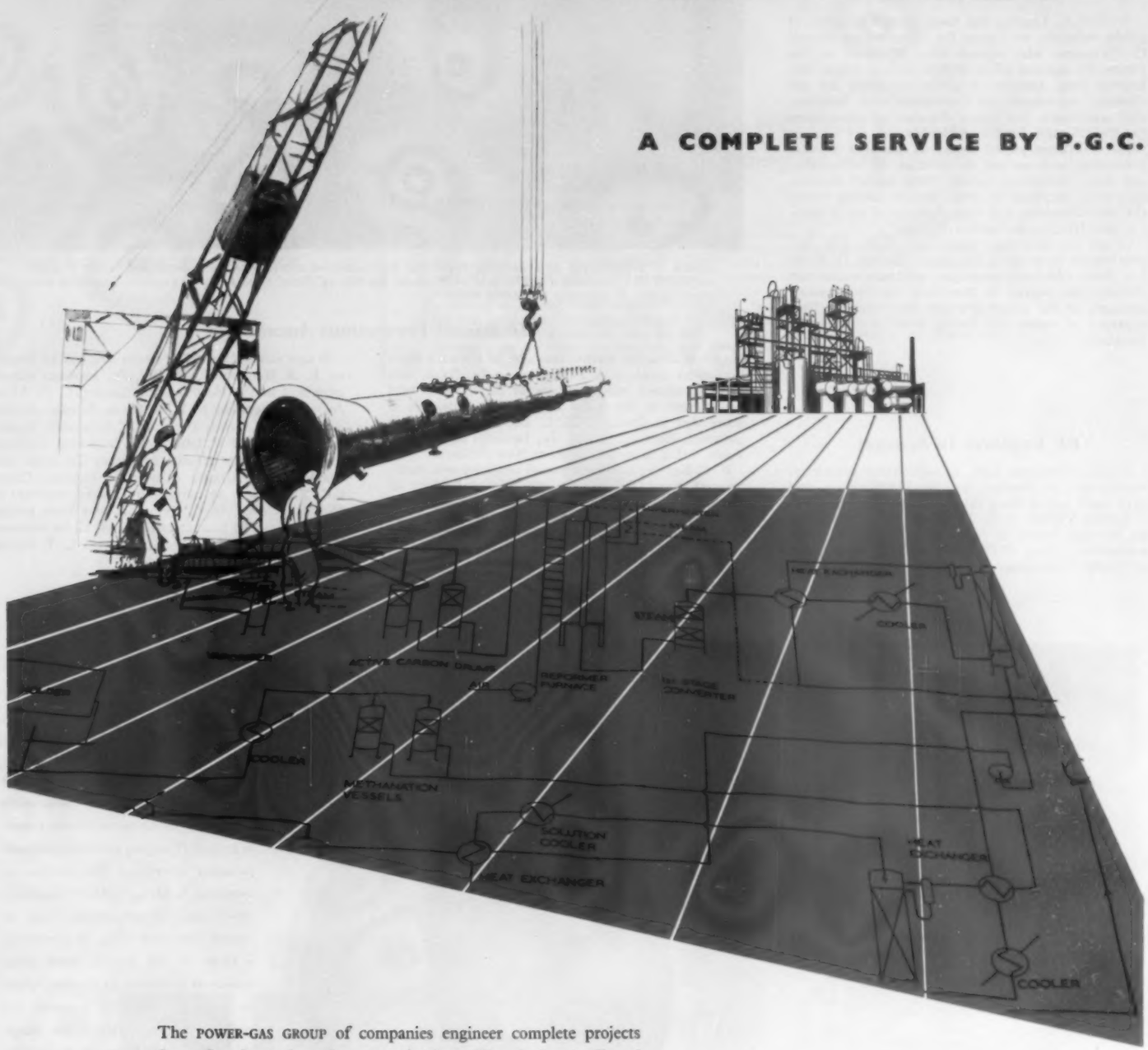
THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

# FROM FLOWSHEET TO PRODUCTION

## A COMPLETE SERVICE BY P.G.C.




The POWER-GAS GROUP of companies engineer complete projects from flowsheet through to production. The design staff and drawing offices produce the working drawings from basic information. The group operates modern works in which plant is manufactured for examination to Lloyds Class I standard, Admiralty Grade A standard, A.P.I.-A.S.M.E. code and A.O.T.C. standard in mild, stainless and special steels.

The POWER-GAS GROUP of companies are designers and manufacturers of plant and equipment for the iron and steel, gas, chemical, petroleum, oil milling and oils and fats industries.

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(PARENT COMPANY OF THE POWER-GAS GROUP)

STOCKTON-ON-TEES · AND LONDON

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No. 238

## Logelin Named Director of Public Relations

Warren A. Logelin has been named director of public relations for Crane Co. He succeeds Russell G. Creviston who retired after 27 years at the company's general office. Before joining Crane, Mr. Logelin was director of public relations for the Chicago Association of Commerce and Industry, and previously had been director of advertising for the Chicago Transit Authority.

Mr. Creviston joined Crane as manager of sales promotion and served as director of advertising and sales promotion before being named director of public relations in 1943. Before joining Crane Co., Mr. Creviston had been director of the Plumbing and Heating Industries Bureau.

Crane Co. has also announced three new appointments to major sales posts. Thomas D. Kelly has been appointed manager of Crane's midwest district, and Darrell R. Nordwall has been named manager of the company's east coast district. New manager of valve and fitting sales is Charles H. Lovelace.

## BP Explores In Senegal

British Petroleum Ltd., is negotiating petroleum concessions in Senegal, French West Africa, and may start test drilling this summer, it is reported.

Societe d'Etude et de Reconnaissance Petrolieres au Senegal, which is ready to work with private companies, plans $3,428,000 worth of exploration in Senegal this year, it is also reported.

*Shown is a fracturing unit boasting twice the horsepower of previous units, as developed by the Halliburton Oil Well Cementing Co. The new unit mounts two 600 hp diesel motors and is designed to obtain maximum volume in pumping fracturing fluids.*

## 16 Baroid Promotions Announced

Jack H. Beesley, former manager of Baroid's Mid-Continent Area with headquarters in Tulsa, has been appointed sales manager of the drilling mud department at the main offices at Houston. He is succeeded at Tulsa by B. L. Boccella, his former assistant; Harry C. Loehr, Jr., becomes assistant at Tulsa, being transferred from New Orleans.

W. C. Kellogg has been named assistant area manager at New Orleans. He was superintendent at Corpus Christi and is replaced by W. A. Henslee, formerly superintendent of West Texas Odessa district. New Texas Gulf Coast assistant area manager at Houston is H. I. Bussa, who transfers from Oklahoma City.

A new sales office in Lafayette, La., will be headed by P. A. Newton. F. M. Hill, Jr., becomes superintendent of the New Orleans district; C. D. Allen, Jr., superintendent of West Texas, Odessa district; Ed. L. Easley, North Texas; J. H. Dunaway, Louisiana Lafayette. H. C. Leland will take over duties as superintendent of Northern British Columbia and Northwestern Alberta district at Dawson Creek, B.C. C. A. Reid becomes Baroid area engineer at Midland, Texas; O. L. Riley, Jr., has been named area engineer at Los Angeles; O. A. Hicks becomes superintendent at Oklahoma City and L. T. Downs district salesman at that point.

Stop pulsation . . .
Pipes carrying gas and air under pressure from pumps, blowers, or compressors may fail, or require special reinforcement, as a result of surging and the consequent pulsatory vibration. This problem is overcome by fitting BURGESS Snubbers, which convert intermittent flow to smooth flow—and which, by eliminating a cause of line failure, often effect economies by permitting less costly pipes to be used. BURGESS Snubbers are made to the specifications and design of the original American BURGESS-MANNING patents.
Oscilloscope recording shows pulsation (left) and smooth flow attained after fitting BURGESS Snubber (right).
BURGESS Pulsation Snubbers
Designed by BURGESS-MANNING, DALLAS, TEXAS · Manufactured by BURGESS PRODUCTS CO. LTD., ACOUSTICAL DIVISION, HINCKLEY, ENGLAND.

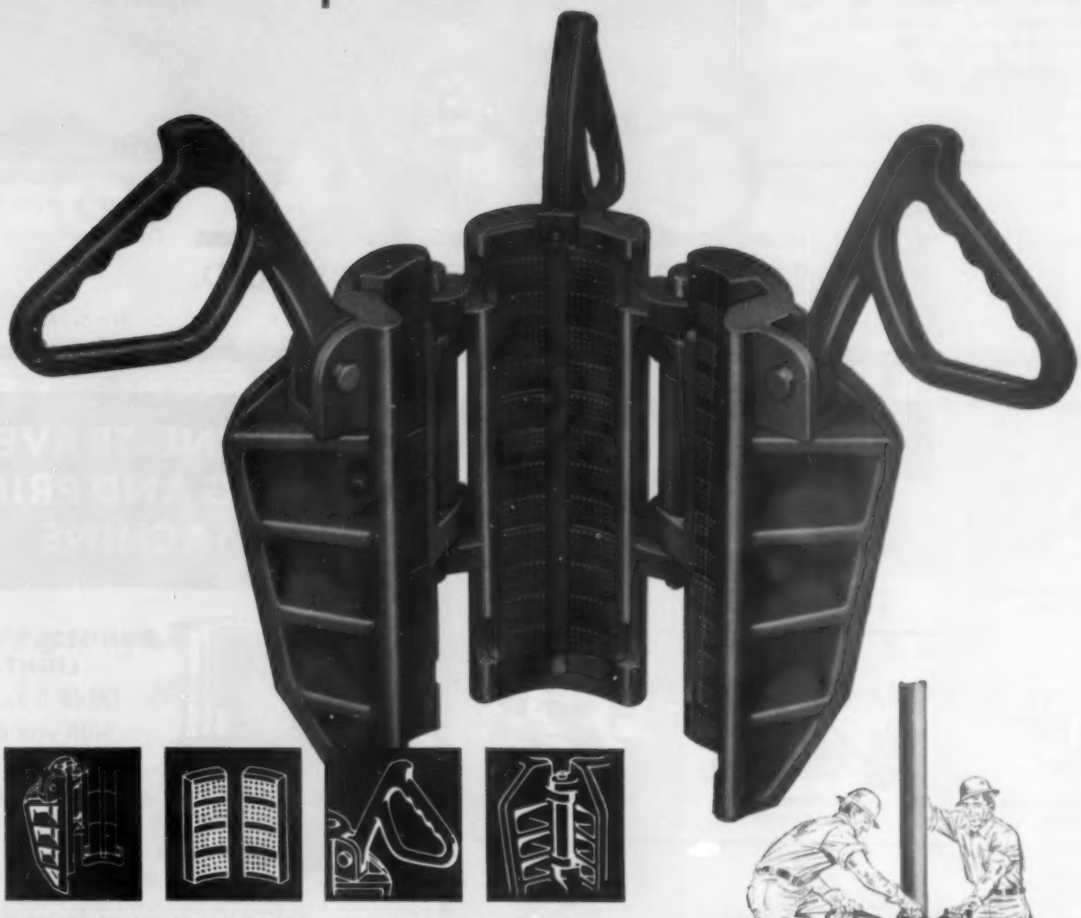
*The most advanced rotary slips in the industry...*

# BAASH-ROSS "DU" ROTARY SLIPS

*are top choice among oil men*

## Because...

1. Their flexibly-hinged unitized design insures a uniform, full-circumferential grip on every setting.
2. Size for size, they are the lightest, best balanced slips available, and are easiest for the crew to handle.
3. Unique segmented liners (each 4" long) are easy to replace, can be re-positioned for longer wear, give a safe grip that will not damage pipe. For maximum simplicity and economy in stockroom, same segments fit both "Regular" and "Long" bodies.
4. By simply changing liners, same body fits wide range of pipe sizes. (Only two body sizes needed to fit all tubing, drill pipe and casing from 2⅜" through 7" O.D.)!
5. Two lengths — 12" (Regular) for wells to 8000' deep. 16" (Long) for deeper wells—cover all requirements, including the longest and heaviest drill strings.





Scientifically-cored backs minimize weight without reducing strength.



Standardized liner segments are easily replaced.



Safety handles protect crew against injury.



"Floating Hinge" rigidly maintains vertical alignment, permits lateral adjustment to irregularities.

**BAASH-ROSS TOOL COMPANY**

DIVISION OF JOY MANUFACTURING COMPANY

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**CLARSOL:** High grade drilling bentonites produced from our Algerian mines, processed to rigid specifications and supplied in quantity to major petroleum companies throughout the world.

**CLARSIL:** Activated earths specifically designed for petroleum refining and available in any quantity and grade required.

**CECA** Group also manufacture and supply to the petroleum industry a full range of activated carbons, filter aids, insulating kieselguhrs and refractory insulating bricks.

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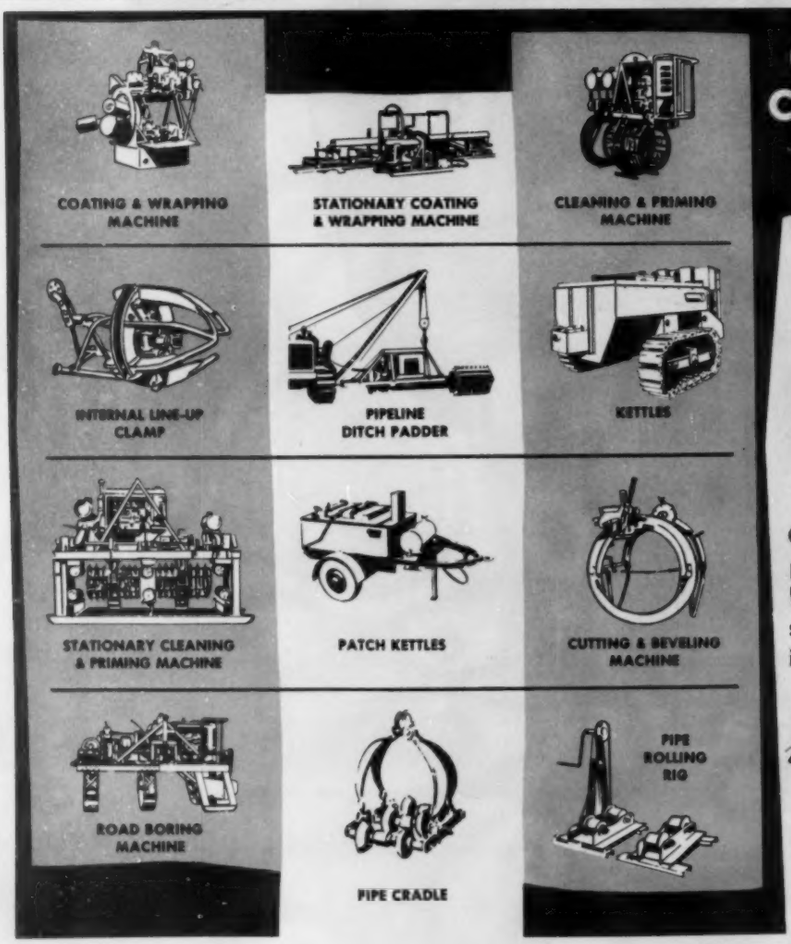
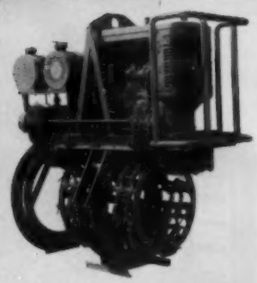



# CROSE LINE-TRAVELING CLEANING AND PRIMING MACHINE



**RUGGEDLY BUILT YET LIGHT WEIGHT.**
Also can be used with stationary base for yard work. Handles pipe up to 36".

Counter rotating heads assure faster cleaning and priming . . . prevent pipe from turning and give better cleaning job. These Crose machines are specifically designed for faster, trouble-free service on the line.

**m.j. Crose Manufacturing Company, Inc.**

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DISTRIBUTOR: *CROSE-CURRAN LTD. — EDMONTON, ALBERTA — PHONE 3-5135
*Warehouses in 4 locations

BUYING SUPPLIES OFF THE SHELF...

...OR ORDERING A COMPLETE RIG READY TO DRILL

## You get Proven Quality . . . Proven Service from MID-CONTINENT SUPPLY COMPANY

The new Mid-Continent field store at Anaco, Venezuela, is another step forward in better field service to the Venezuelan oil industry.

The trailer-mounted drilling rig shown above on location in Venezuela is an example of Mid-Continent service in supplying major drilling equipment around the world. Equipment supplied by Mid-Continent Supply Company for this highly portable, fully unitized rig includes a Unit Rig U-40 drawworks, Unit Rig three-engine compound rig drive, the trailer on which the drawworks and rig drive are mounted, and an Emsco D-850 slush pump.

Around the world "wherever there is oil" you can rely on Mid-Continent Supply Company for proven products and service.

EXPORT DIVISION: 45 Rockefeller Plaza, New York, N. Y. U.S.A.

**MID-CONTINENT Supply Company**

MID-CONTINENT BLDG. FORT WORTH, TEXAS

ANACO • CARACAS • MARACAIBO

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

# NOTICE

The National Iranian Oil Company offers for sale, during the year 1957, a total quantity of 3,660,000 long tons of Iranian Light Crude Oil in following quarterly quantities F.O.B. Bandar Mashur.

| | *U.S. Barrels* | *Long Tons* |
|---|---|---|
| First Quarter | 6,683,000 | 890,000 |
| Second Quarter | 6,840,000 | 910,000 |
| Third Quarter | 6,919,000 | 920,000 |
| Fourth Quarter | 7,076,000 | 940,000 |
| Total | 27,518,000 | 3,660,000 |

***MAIN CHARACTERISTICS OF THE CRUDE OIL OFFERED ARE:***

| | |
|---|---|
| Average Specific Gravity @ 60°F | 0.8530 (34.39 A.P.I.) |
| Sulphur % Wt. | 1.3-1.4% |
| Vapour Pressure | 6.5-8.0 lbs. at 100°F |
| Salt Content | 5.2 lbs. approx. per 1000 bbl. |

***THOSE INTERESTED ARE REQUESTED TO INDICATE:***

**1—Price offered per barrel of 42 U.S. Gallons f.o.b Bandar Mashur.**

**2—Quantity of crude oil required**

**3—Period during which the required quantity will be lifted**

**4—Currency in which payment will be effected. (Preference being given to payments in currencies of international convertibility).**

**5—Whether the purchaser is prepared to put up a performance bond.**

**6—Whether the purchaser would arrange for vessels carrying crude oil to be bunkered by the National Iranian Oil Company.**

**7—Banks to which reference can be made.**

This offer is open until September 30th, 1956, and the National Iranian Oil Company will notify its acceptance or rejection of the proposals received before the 30th November, 1956.

The National Iranian Oil Company is also prepared to consider offer for long term contracts for the purchase of Iranian Light Crude Oil.

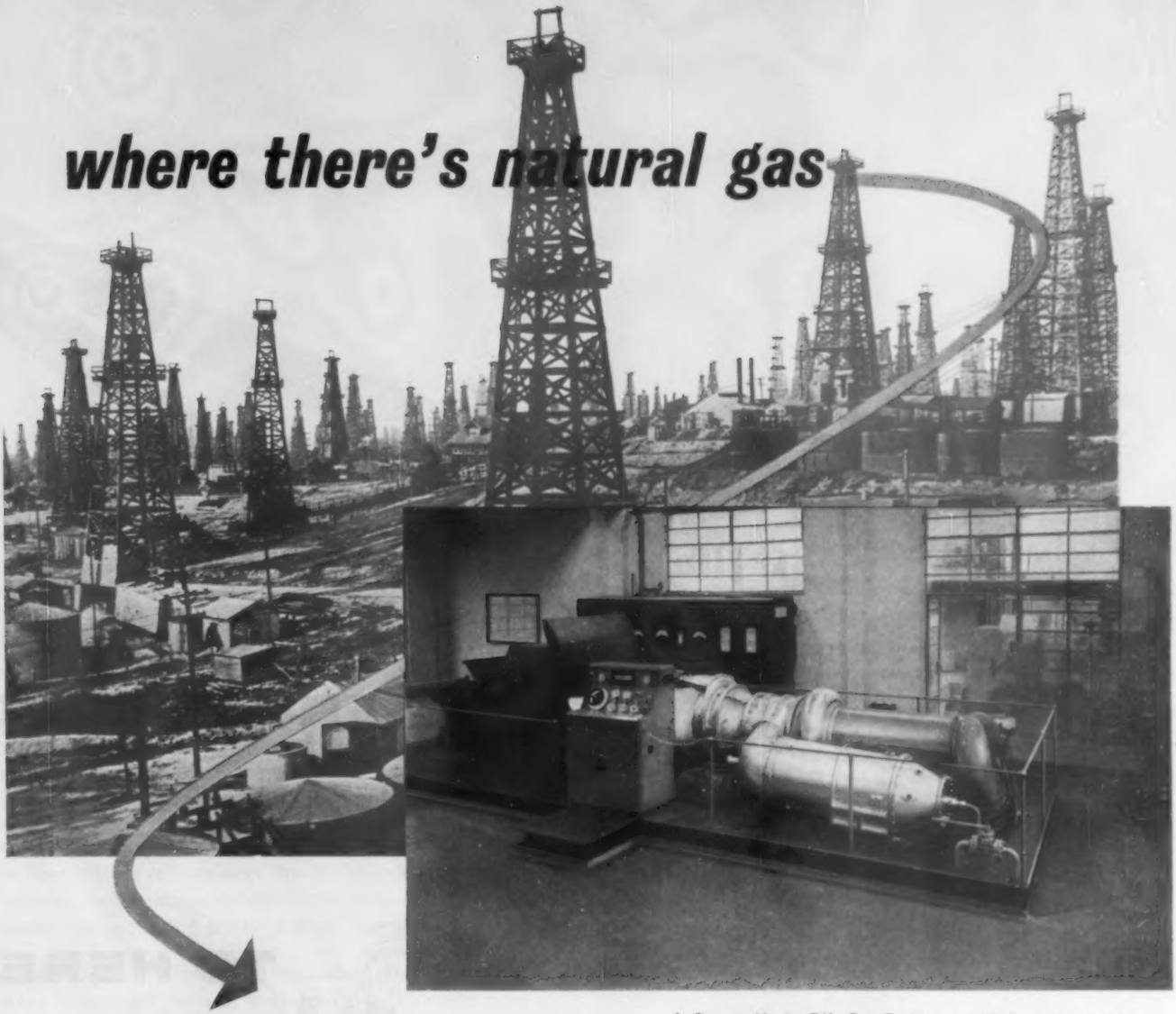
Proposals may be directed to the National Iranian Oil Company, Teheran, or to the Iranian Embassies, Legations, or Consulates abroad.

**NATIONAL IRANIAN OIL COMPANY**

*Makes fine drums!*

MOON BROTHERS LIMITED
BEAUFORT RD, BIRKENHEAD, ENGLAND

# *where there's natural gas*



*A Ruston Mark 'TA' Gas Turbine installed at the A.G.I.P. refinery at Cortemaggiore, Italy, runs on natural gas and supplies power and heat for the plant.*

# RUSTON GAS TURBINES

## are the most economical means of power *and heat* supply from 1000 to 1400 b.h.p.

★ ***For information on the many outstanding features of these versatile, long-life power units, please write for brochure No. 9414X***

★ **Ruston Gas Turbines are going into service on all 5 continents**

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*ASSOCIATED WITH DAVEY, PAXMAN & CO. LTD., COLCHESTER*

IT'S A LONG, LONG WAY...

FROM HERE

TO HERE!

Geographically, from the source of crude to the ultimate application of the final refinery product may be half a world . . . or only a few miles. 10 miles or 10,000 miles, you can be sure that the finished product has come a long, long way.

The demand for better motor fuels created by the continuing improvement of the modern automotive engine is a constant challenge to the refining industry to keep this road from reaching impractical or impossible lengths.

For over 40 years, the research and engineering staffs at Universal have been helping refiners meet this challenge by consistently developing, and making available to the entire industry, improved processes for producing products from petroleum.

No matter the brand name of the finished product, chances are its journey from well to gas tank was helped along by one or more UOP processes. Refiners, all around the world, are using them to provide better products, more efficiently and with significant economy.

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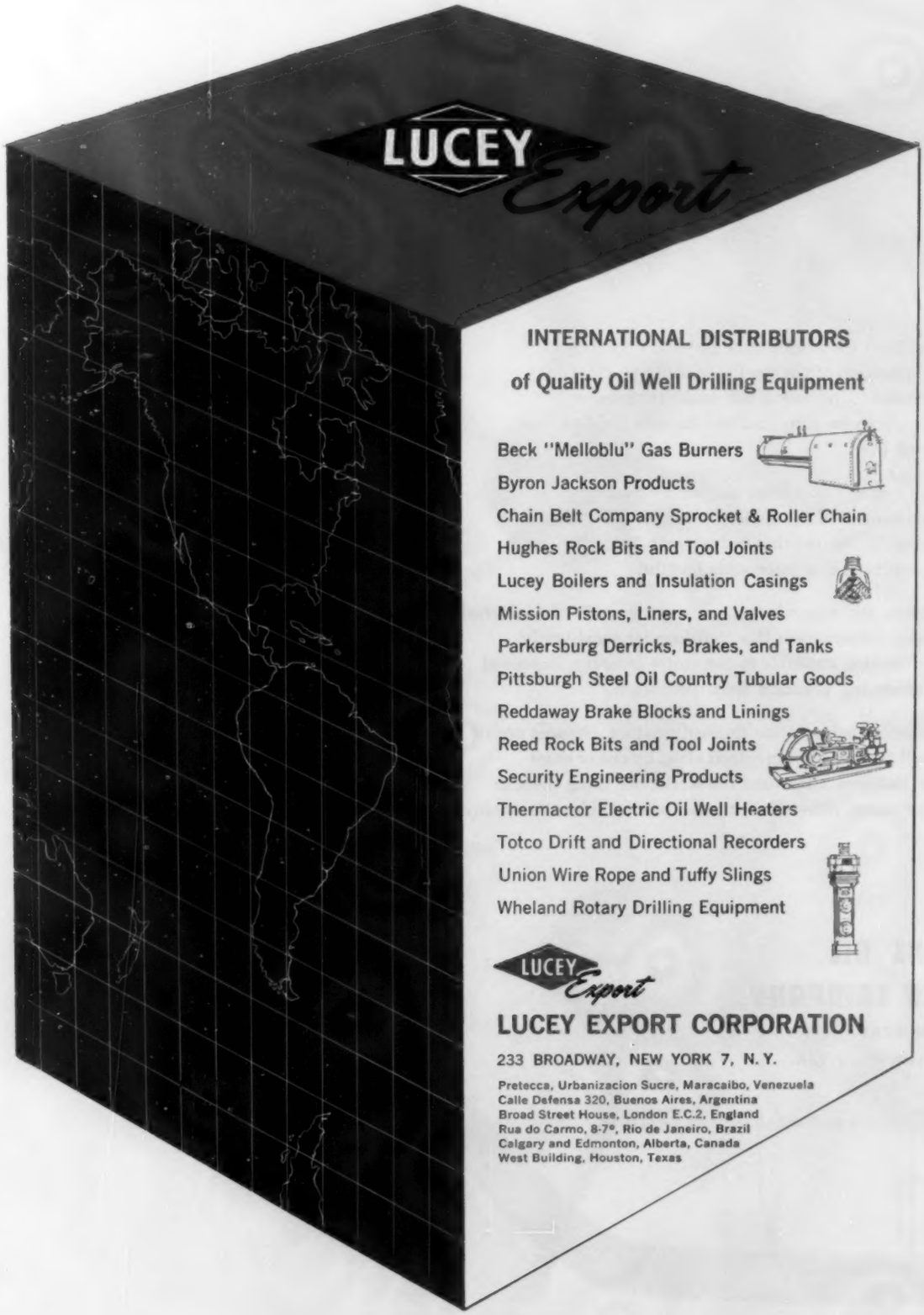
**30 ALGONQUIN ROAD,**
**DES PLAINES, ILLINOIS, U. S. A.**

*Forty Years of Leadership In Petroleum Refining Technology*

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# ...your low-cost key to high octane

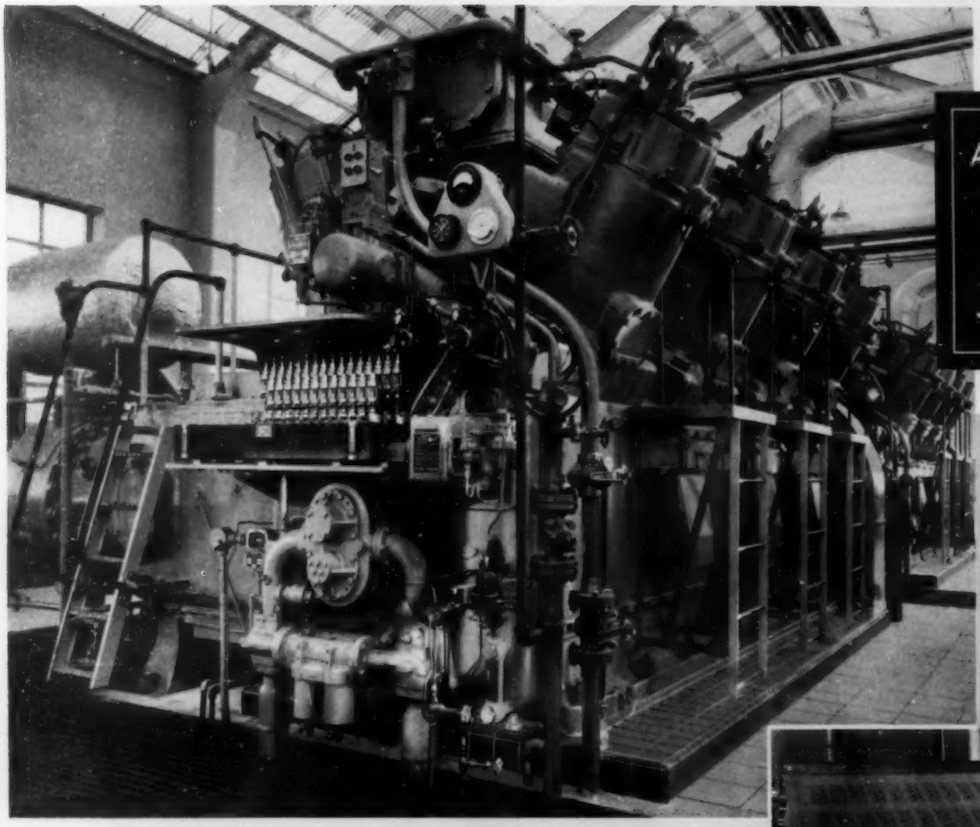
Atlantic's Catalytic Reforming Process continues to prove its ability in giving superior results on a broad variety of feed stocks. Catforming's simplicity brings savings through increased efficiency every step of the way—actually eliminating many profit-robbing intermediate steps.

Regardless of the volume of your charge stock, Catforming deserves your attention. One major reason that Catforming has "proved out" commercially is attributable to Atlantic's broad experience in all phases of petroleum refining and processing.

We invite your inquiries on Catforming. Write or wire The Atlantic Refining Company, Research and Development Dept., P.O. Box 8138, Philadelphia 1, Pa.

ATLANTIC

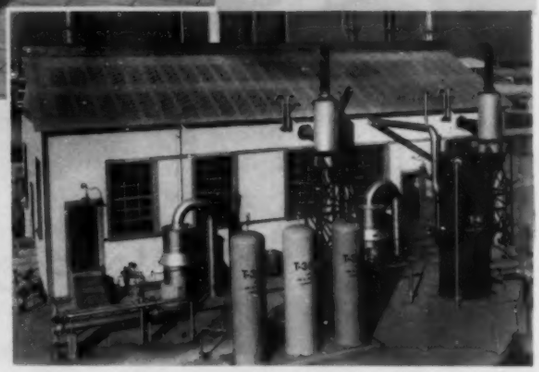
it's the CATALYST that counts



*Another example of efficient compression at lower cost*

Petroleos Mexicanos' Reynosa station, showing 8-cylinder Cooper-Bessemer V-angle compressors.

Exterior view of the neat, compact Reynosa gasoline plant.



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## FOR PETROLEOS MEXICANOS

*. . . extreme dependability*
*. . . extremely economical*

● The compression of natural gas and propane in Petroleos Mexicanos' gasoline plant, Reynosa, Tamps., Mexico, is a perfect example of extremes . . . all good!

Handling three pressure ranges, and handling them reliably and at low cost, is a brief summation of the Cooper-Bessemer performance story in this modern station.

Two 8-cylinder Cooper-Bessemer compressors handle plant process gas as well as compressing gas for distribution in northeast areas of Mexico and for export.

Known not only for performance . . . the name Cooper-Bessemer means cooperation and service all along the line. Detailed installation recommendations, experienced service engineers, availability and rapid delivery of spare parts from centrally located warehouses . . . each helps make your job easier, helps keep costs at a minimum. Find out for yourself, next time plans call for compressors up to 6,000 hp, check with Cooper-Bessemer.

ENGINES: GAS • DIESEL • GAS-DIESEL COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE OR MOTOR DRIVEN

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EXTREME INTERCHANGEABILITY THROUGHOUT THE RANGE CONSIDERABLY REDUCES THE FLEET OWNER'S SPARE PART PROBLEMS AND CUTS EXPENSES.

LOW AIR TEMPERATURE INCREASES LIFE OF ALL VALVES, WORKING PARTS AND PNEUMATIC TOOLS.

HIGH EFFICIENCY UNDER EXTREME WORKING CONDITIONS IN ALL CLIMATES GIVING RELIABLE UNINTERRUPTED PERFORMANCE.

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c.f.m. free air delivered

SUPPLYING THE WORLD'S NEEDS FOR
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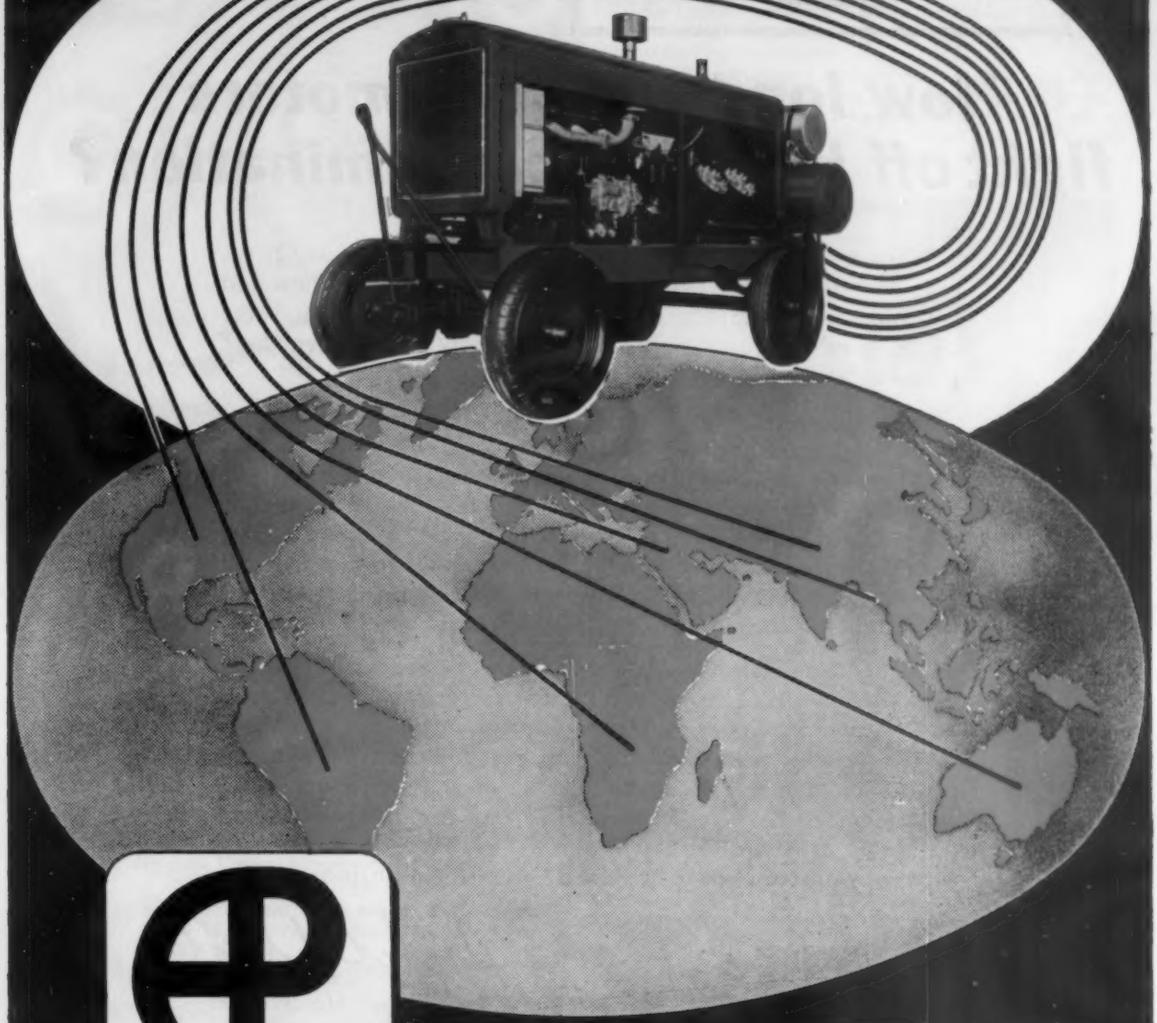

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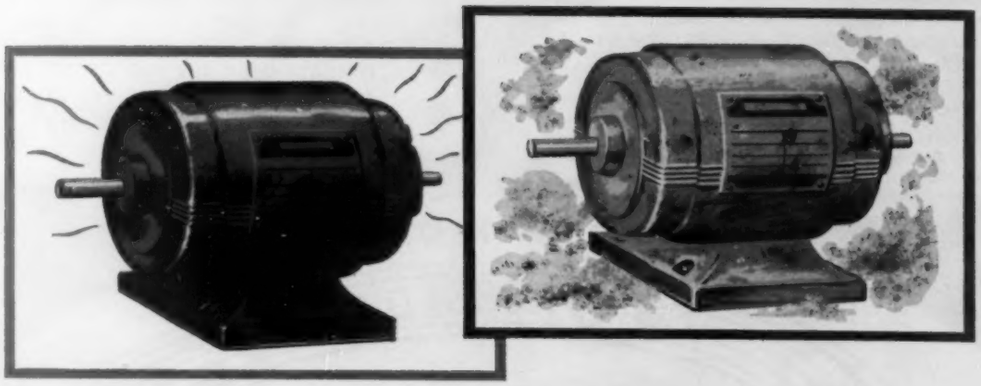

# How long can your motors fight off heat and contamination?

When motor insulation breaks down, the motor quickly burns out. And the two chief enemies of motor insulation are heat and contamination. The life expectancy of your motors—and the efficiency of your operations—depend directly on the strength of their insulation.

For this reason the new Westinghouse Life-Line A motor features super-tough insulation for conductors, coils and wound stator. Conductors are insulated with Bondar, a new synthetic resin that *lasts three times longer* than ordinary insulation. Slot cells in coils are insulated with Mylar, a polyester film that withstands 15,000 volts. Stator insulation is Bondite, a thermoset varnish reinforced with silicones that effectively seals out water and water vapor as well as oil and chemicals.

Besides this fortified insulation system, Life-Line A motors offer a new "armorized" housing for greater protection, 4-way seal, prelubricated bearings (no on-job greasing), drip-proof ventilation —all features designed to give you a motor that delivers top performance under every kind of operating condition . . . and keeps on doing it. And you can order the Life-Line A motor right now in ratings up to 30 hp, 1800 rpm. If you'd like more facts, write for your copy of free 24-page booklet BX-6154-A (in English).

R. G. SCHOLL, *Manager*
Industrial Equipment Dept.

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WHATEVER your high-temperature steel problems—heat, pressure, corrosion, oxidation—there's always one tube steel among the Timken Company's 24 different high-temperature analyses that will do the best job. One that will give you the maximum service per dollar and cost per year of required service—the best life/cost ratio.

To find this *one,* right analysis, *ask the experts!*—the metallurgists of The Timken Roller Bearing Company.

These experts are recognized authorities on high-temperature steels, have been for over twenty years. And they're ready to put their experience to work for you. They'll study your particular requirements, recommend the one tube steel to most satisfactorily and economically meet them. Result: you get the longest tube life per dollar.

And you can be assured of uniform high quality in the Timken® steel you get. For the Timken Company controls and guards steel quality from the furnace to final inspection.

Call on Timken Company metallurgists for understanding help in solving your tube steel problems. End uncertainty. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

**SICROMO-7**

Suggested as a subsitute for steels of the 5.0 per cent chromium type for applications which require increased resistance to corrosion by hot petroleum products.

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| DM-2 | 2½% Cr.-1% Mo. | Sicromo 7 | 25-12 |
| Silmo | Sicromo 3 | Sicromo 9M | 35-15* |
| DM | 4-6% Cr.-Mo. | 18-8 Stainless | 16-25-6* |
| 2% Cr.-Mo. | 4-6% Cr.-Mo.-Ti | 18-8 Cb | |

*Not available as seamless tubing at the present time.

*General view of the Timken Company metallographic laboratory where many analyses of steels are viewed under high-power microscopes.*

**See us at the NATIONAL METALS EXPOSITION, Oct. 8-12, Public Auditorium, Cleveland, Ohio, BOOTH 1051**

**SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING**

Grill Flooring fitted at the Shell Oil Refinery, Stanlow. Photograph reproduced by courtesy of Shell Information Unit.

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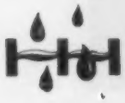

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There is a wide range of applications for Grill Flooring in industry, and at all times we welcome enquiries for individual applications and offer the services of our designers in dealing with specific jobs where Grill Flooring might be conveniently applied.

Associated Company: Deco Engineering Company Limited, Manufacturers of Special Electrical Equipment for every class of Handling Plant.

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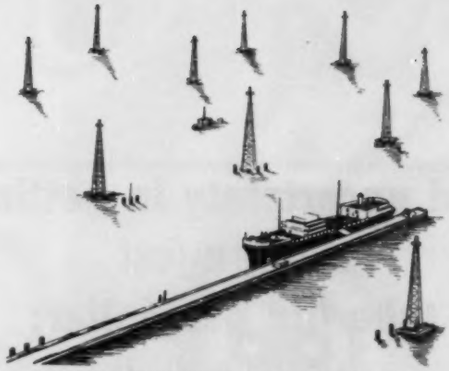

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The production of paints that will give lasting protection to oil installations and the buildings connected with them demands the very highest standards of paint manufacture. International have long specialized in the production of paints specially formulated for this purpose — paints that are specified by many of the world's leading oil companies.

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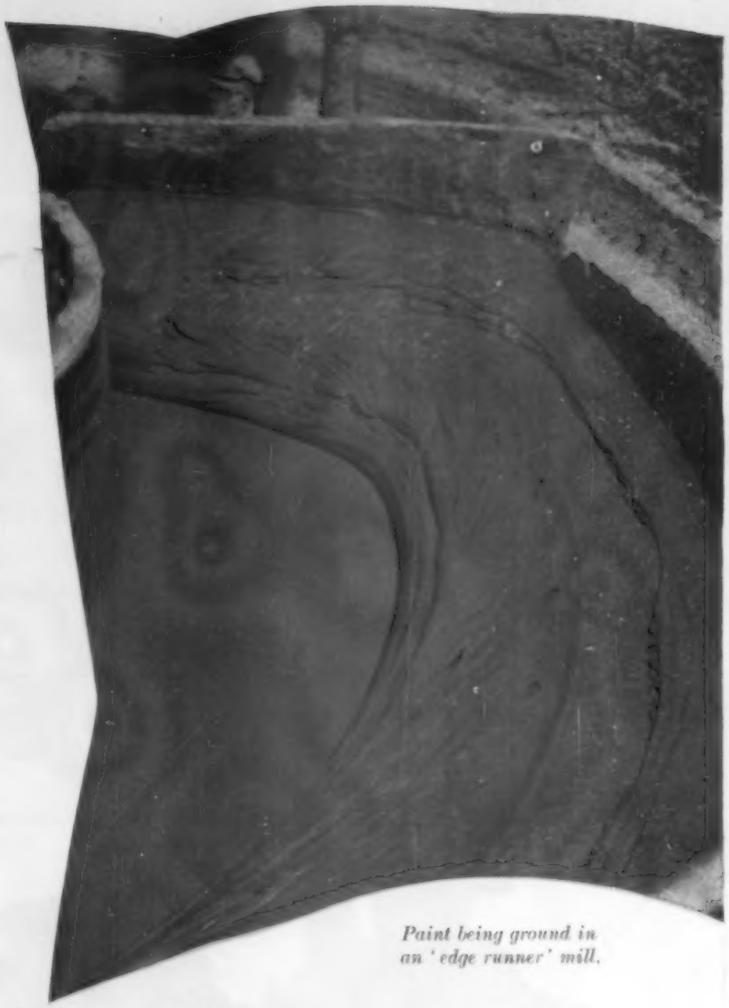
**RED LEAD GRAPHITE PRIMER**
Gives an exceptionally hard film . . . spreads evenly and is extremely economical.

**BROWN CHROMATE PRIMER**
Highly rust-inhibitive, quick-drying with good coverage and easy application.

**YELLOW PRIMOCON**
A zinc chromate primer for use on aluminium, light alloys and zinc. Also suitable for steelwork.

With a worldwide organisation of 23 factories in 16 countries, International can supply paints to any site. Their advisory service is always available to assist in any painting problems. Enquiries are cordially invited.



*Paint being ground in an 'edge runner' mill.*

**International Paints Ltd.**

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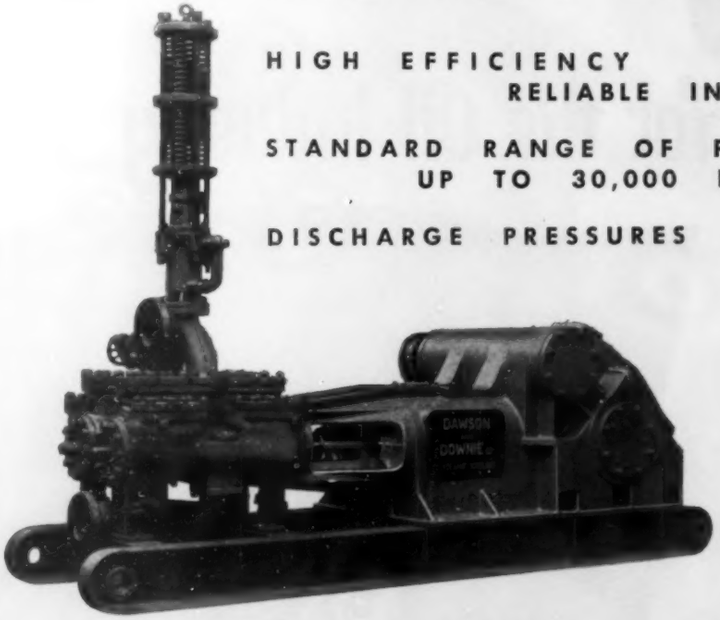
# OIL PIPE LINE PUMPS



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STANDARD RANGE OF PUMPS WITH CAPACITIES
UP TO 30,000 BARRELS PER DAY

DISCHARGE PRESSURES UP TO 1250 LB/SQ. IN.

Illustration shows one of a series of pumps supplied to BRITISH PETROLEUM CO. LTD.'S refinery at ADEN, for pumping diesel and fuel oils from the refinery to the B.P. bunkering installation.

## DAWSON & DOWNIE LTD

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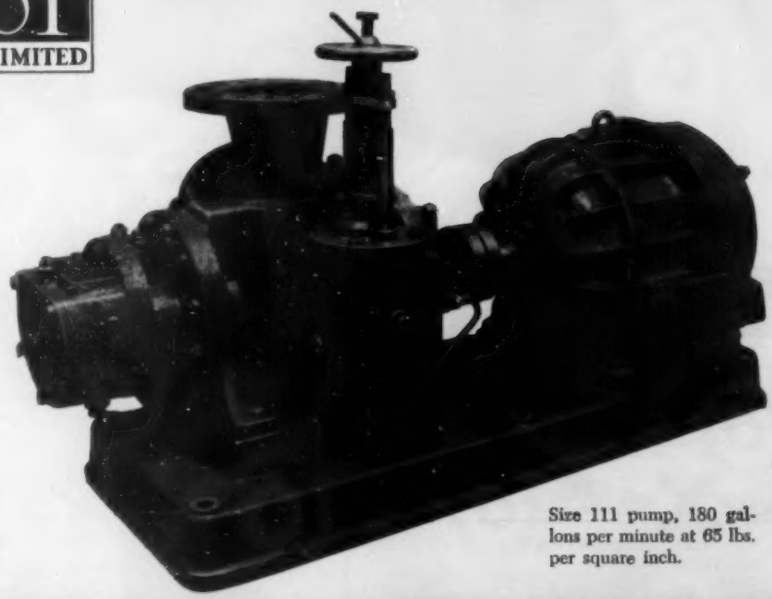
Telephone: Clydebank 2271/2/3

S&P LIMITED

# AVIATION SPIRIT PUMP



Size 111 pump, 180 gallons per minute at 65 lbs. per square inch.

Ideal for handling spirit and other volatile fluids. This Screw Displacement Pump is of the all round clearance design and is capable of working with a high suction lift. The flow is practically pulseless and the unit self-priming. The high speed permits direct coupling.

The Pump will stand high shock loads and running for considerable periods against closed discharge without overheating.

Also suitable for heavy fuel and all other petroleum products.

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The pipes and fittings are being butt-welded together (see section below).

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**By shrewd planning and efficient direction there is no shortage of skilled design staff at Matthew Hall.**

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**The Matthew Hall Group can engineer your plant from conception to completion—not only design but procurement, construction, and commissioning too!**

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Ferranti Electronic Computers have been installed or ordered by Business Organisations and Research Establishments in a number of overseas countries, in addition to the many used in Britain. These computers have a great variety of uses in research and industry. Write for full information to Ferranti Ltd., Computer Department, Moston, Manchester 10, or London Computer Centre, 21, Portland Place, London, W.1.

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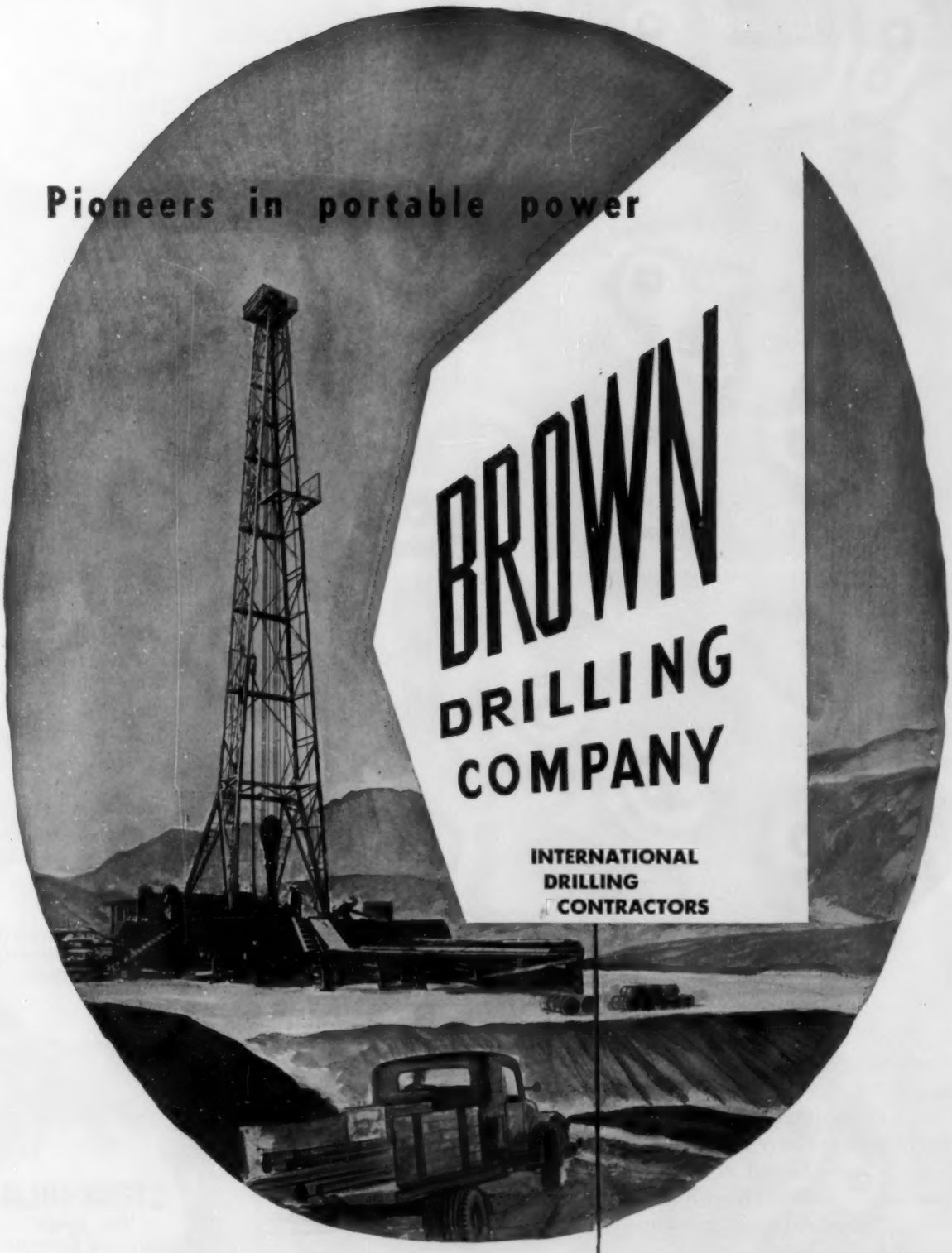

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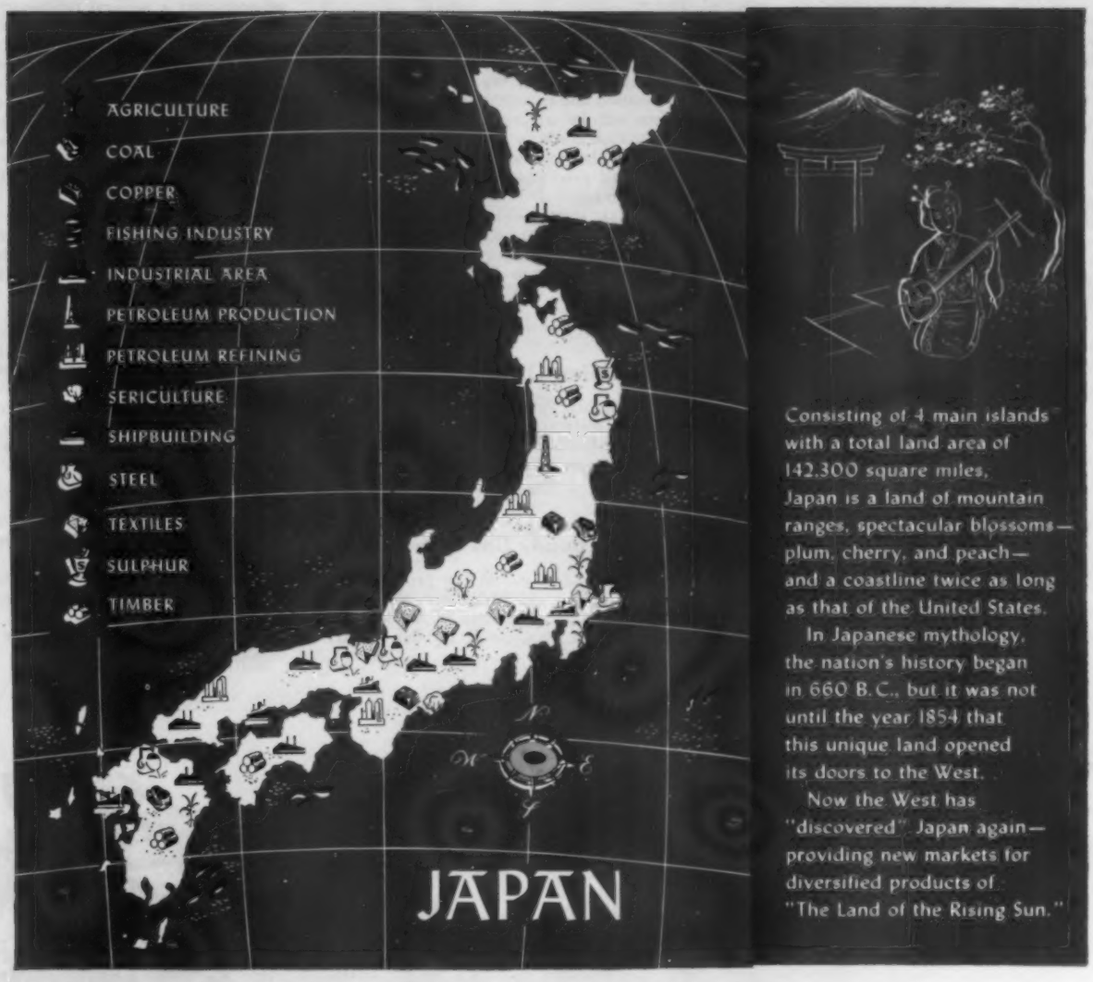
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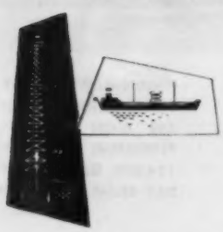
JAPAN
Consisting of 4 main islands with a total land area of 142,300 square miles, Japan is a land of mountain ranges, spectacular blossoms—plum, cherry, and peach—and a coastline twice as long as that of the United States.
In Japanese mythology, the nation's history began in 660 B.C., but it was not until the year 1854 that this unique land opened its doors to the West.
Now the West has "discovered" Japan again—providing new markets for diversified products of "The Land of the Rising Sun."

**LAND OF THE RISING SUN . . .** Despite her enormous losses of manpower and productive capacity in the last war, Japan, restored to full sovereignty in April, 1952, has made a remarkable economic recovery in the short space of 10 years. Today Japan is striving successfully to meet high-level foreign demands for raw materials, textiles, machinery, precision optical goods, chemicals, and specialty food products.

Japan is America's number one customer for many raw materials and basic foodstuffs, while America in turn has become a leading market for Japanese goods. This exotic land of more than 89 million population is today the only Asian country producing and supplying machinery to countries in the East . . . petroleum demand has increased over 60 per cent since prewar days, mainly due to the enlarged scope of Japan's industrial and business activities.

**Standard-Vacuum is proud** of the part it has played in the economic recovery of this ancient and picturesque country through technological assistance contracts, enabling affiliated Japanese refineries and manufacturers to keep pace with the latest petroleum refining techniques and to utilize a number of processes developed abroad during the past decade.



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## Spanish Refining Up

Compania Espanola de Petroleos, S.A., expects to step up its refinery operations this year to handle a total of 1,824,743 metric tons (36,500 b/d) of crude oil. This is an increase of 420,000 tons (8,400 b/d) over last year. The figures for each year include 300,000 tons (6,000 b/d) refined for others.

The company will import 1,676,000 metric tons (33,520 b/d) of crude this year, and process 300,000 tons for others, a total of 1,976,000. The difference of 152,000 metric tons (3,040 b/d) is to be added to crude stocks.

Looking further ahead, reports are that the total refining capacity in Spain will reach six million tons (120,000 b/d) a year by 1960. This is up from 3.5 million (70,000 b/d) at the start of this year. The 1960 figure will include four million tons of capacity at the Escombrera refinery, which is being expanded from two million tons.

CEPSA is to receive a new tanker in the latter half of this year of 18,500 tons capacity, and in coming years plans to build two tankers of 32,000 tons each, with 16-knot capacity. These are to come into use by or before 1960, when present long-time charters come to an end.

The tanker program is being keyed to a need for crude imports of 2,100,000 tons (42,000 b/d) by 1960 for CEPSA.

Oil exploration continues in the Gastian area with a gas field found at Zuniga No. 1 at 2,500-2,800 meters and at 3,040-3,085 meters, but the drilling was halted at 3,127.

New American drilling equipment is due, which will go to 5,000 meters (15,000 feet) at Zuniga No. 2 well.

## New Refinery in Turkey

The Turkish government has approved an application for the erection of a 15,000 b/d refinery at Istanbul, Turkey.

Applicants are a private group consisting of Frank D. St. Hilaire of Los Angeles and others. Processing facilities will include crude and vacuum distillation, catalytic cracking, vapor recovery, catalytic polymerization and complete supporting facilities. Operations will be on imported crude at first switching on Turkish crude as it becomes available.

The plant will be designed to increase capacity as demands for refined products increases in Turkey. August, 1958, is the scheduled date for initial operation. A refinery contractor has not been selected as yet but this is expected to be settled shortly.

The output of this new refinery plus the existing refinery at Batman will meet almost the entire needs of the Republic of Turkey for refined products.

## Romanian Oil Plans

Romania plans a high-grade lube plant and a 12,000 b/d primary distillation plant in 1950. $416.6 million will be invested in the oil industry in 1956, which is more than any other industrial branch is to receive.

## Yugoslavia Expands Gas Reserves

Total reserves of natural gas in the province of Croatia have been given at 52,965,000 mcf. Reserves are concentrated mainly in the area of Moslavina, in the vicinity of Janja Lipa, Golja, Klostar, Dugo Selo.

## Petroleum Law Proposed In Costa Rica

Costa Rica's Legislative Assembly is in the process of preparing a general petroleum law. At present, no such legislation is on the books.

Union Oil Co. of California at present holds exclusive exploration and exploitation contracts, through a subsidiary, with the government for the large Province of Limon in the southeastern section of the country to the Panama border, and in Guanacaster, a large territory in the northwestern area of Costa Rica bordering Nicaragua.

Union's agreement is on the basis of a special contractual arrangement which was approved by the Legislative Assembly. The contract provides that once Union has discovered petroleum deposits of importance, it must relinquish its exclusive rights to all but 375,000 acres in Costa Rica.

Union recently discovered oil shows in Caroles #1 well, near the Panama border in the Province of Limon. The importance of the discovery will not be known for at least another month. Should the well turn out to be a commercial producer, Union will automatically relinquish its rights to other areas, which may be of interest to international oil companies. Under these circumstances, interested members of the Assembly feel that the government should be prepared in advance with a modern petroleum law under which new concessions could be granted without delay.

Venezuelan and Guatemalan oil laws are currently being studied and a request for the aid of an expert in that field has been made to the U. S. Embassy at San Jose, presumably via Point Four. In addition, the Ministry of Economy is also busy studying possible oil legislation independently of the Legislative Assembly and may introduce its own version of a general oil law.


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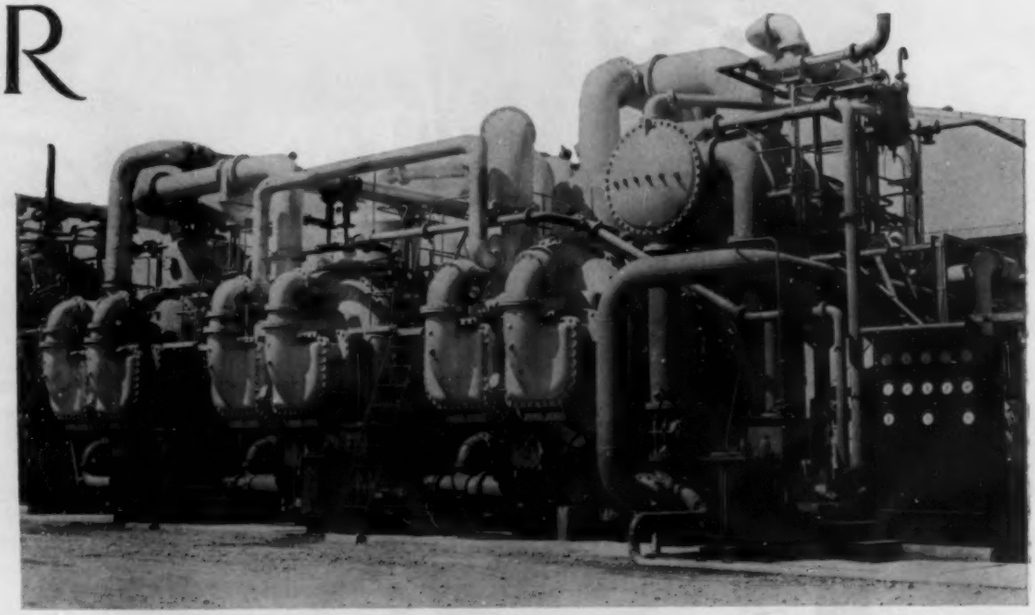

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*Write for Publication No. IL. 151.*

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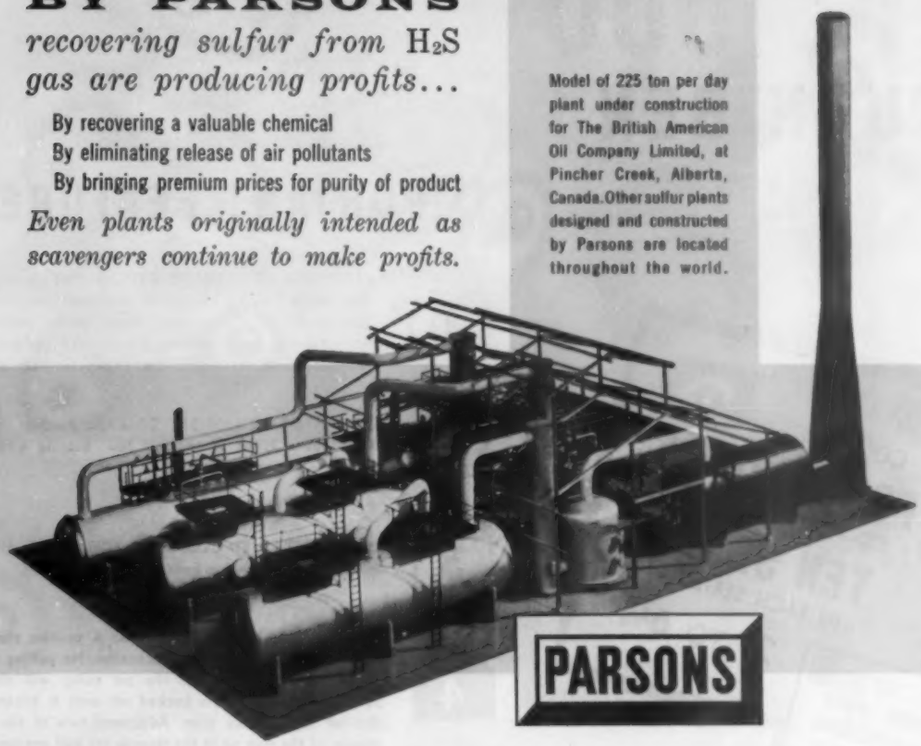


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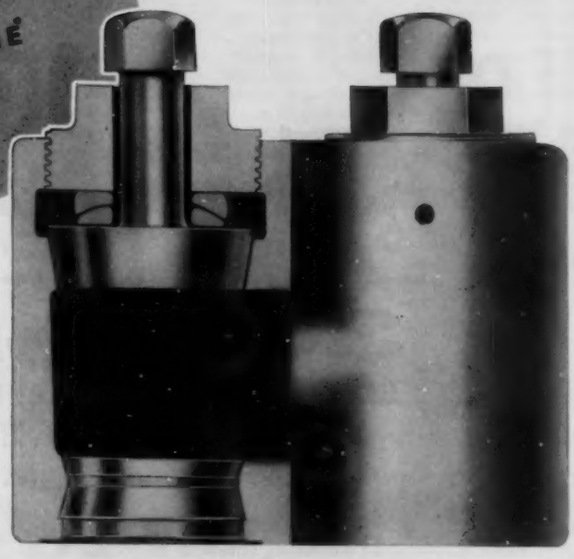

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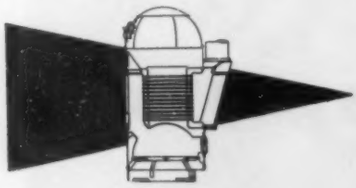

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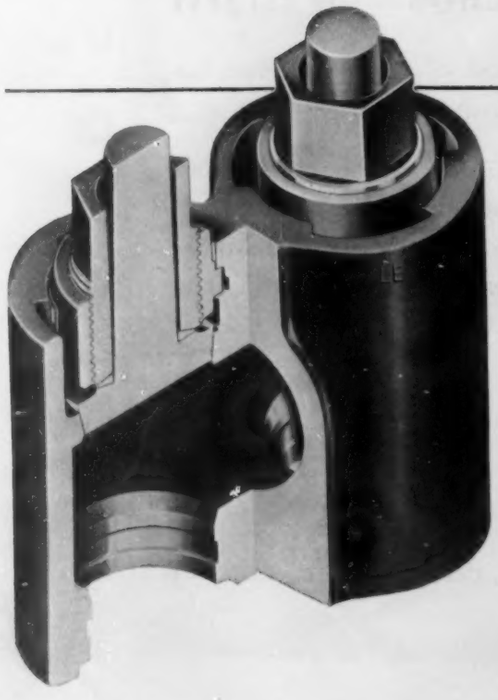

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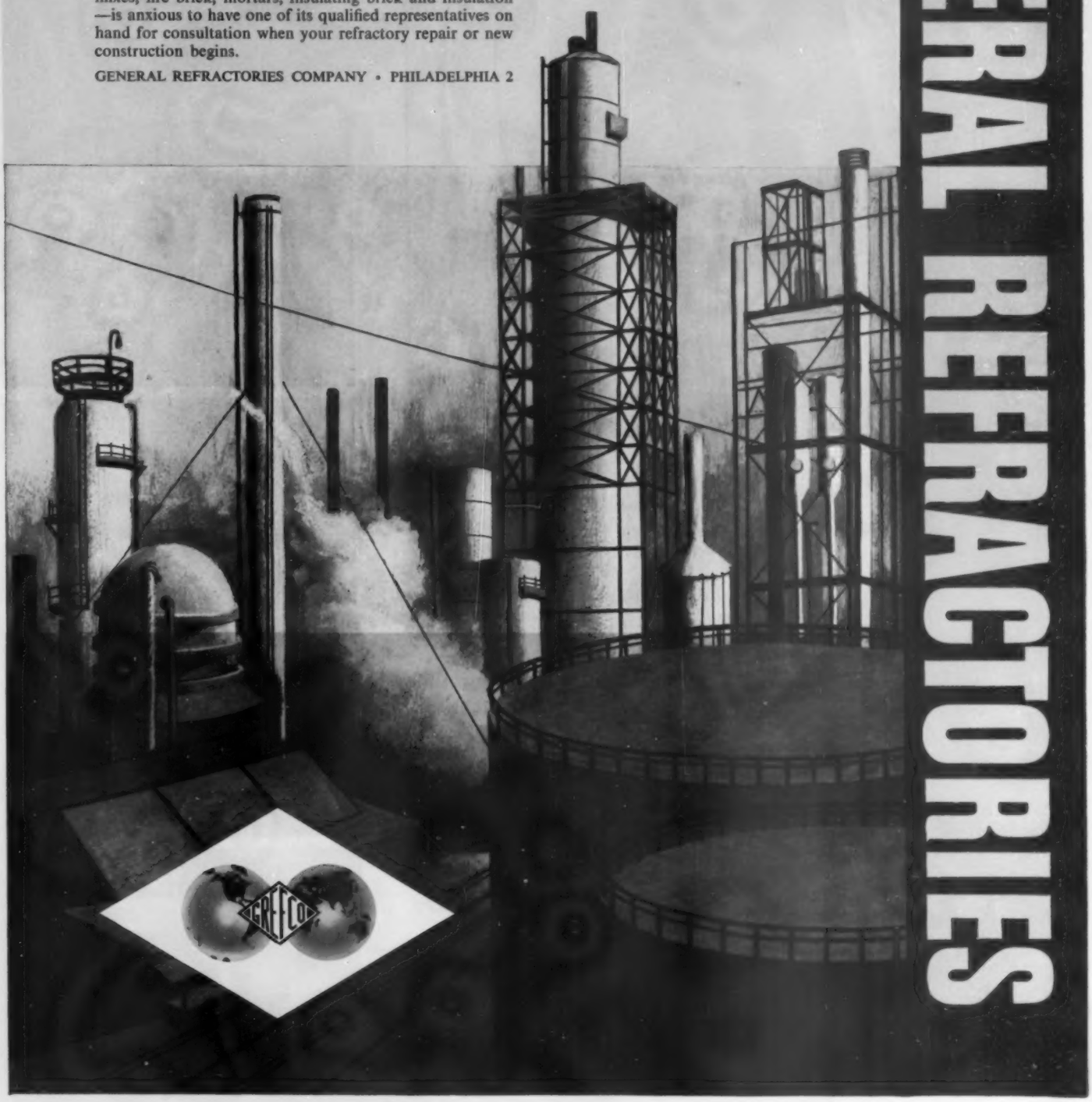

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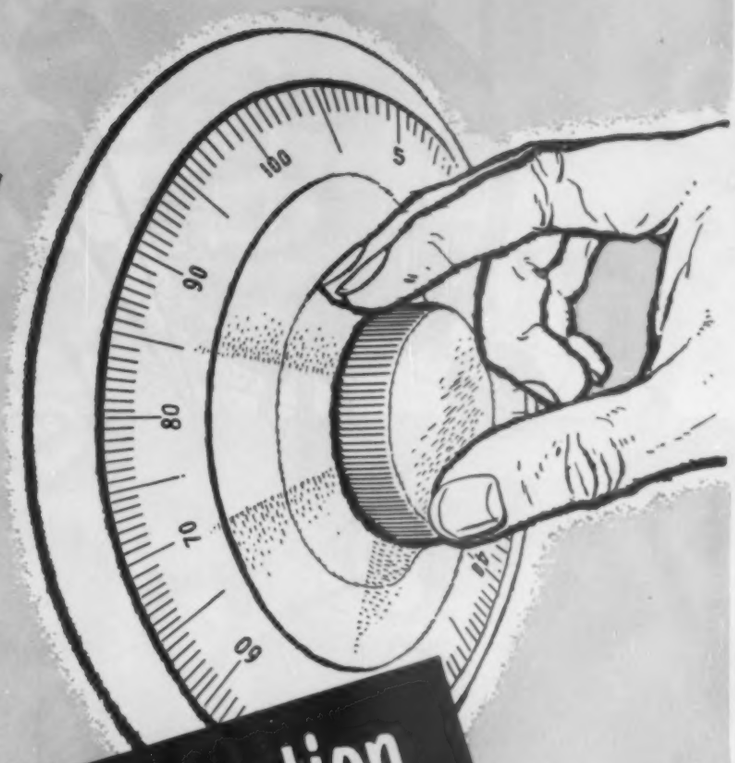

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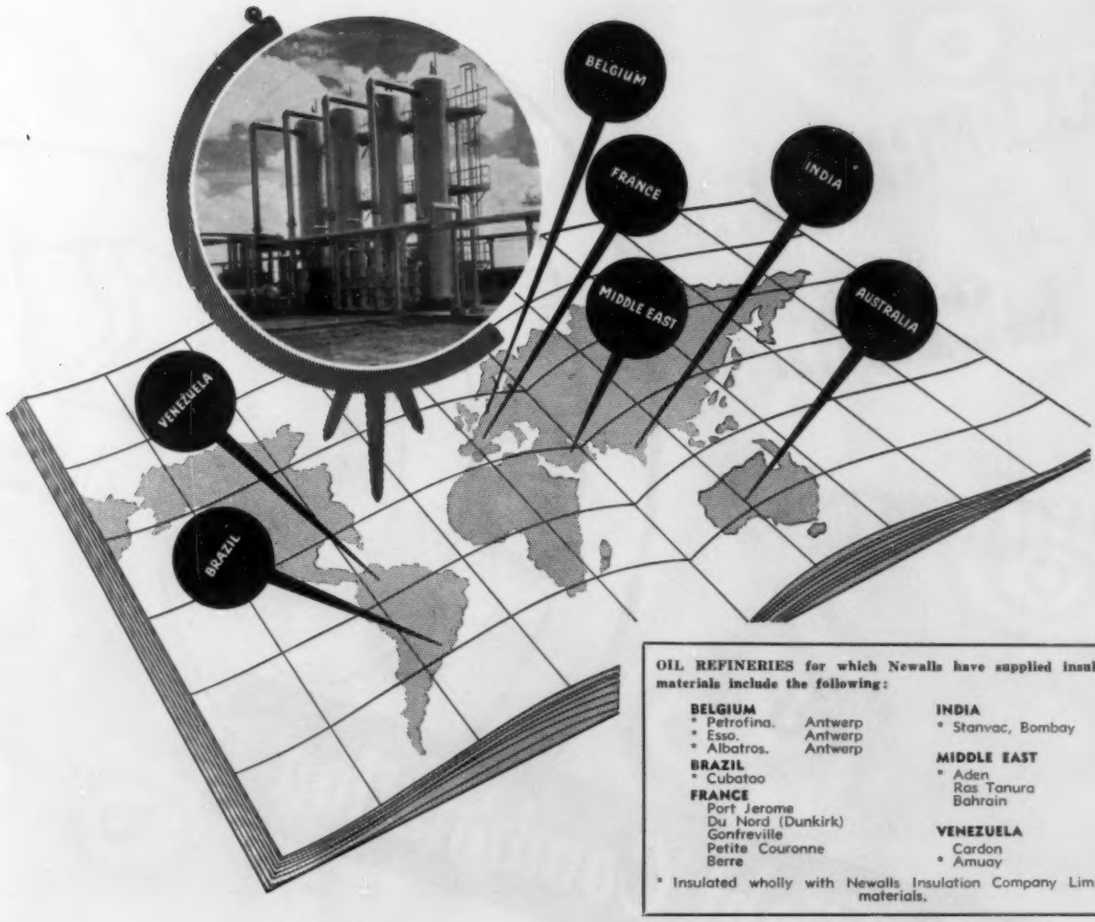


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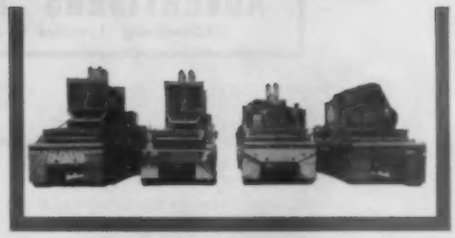

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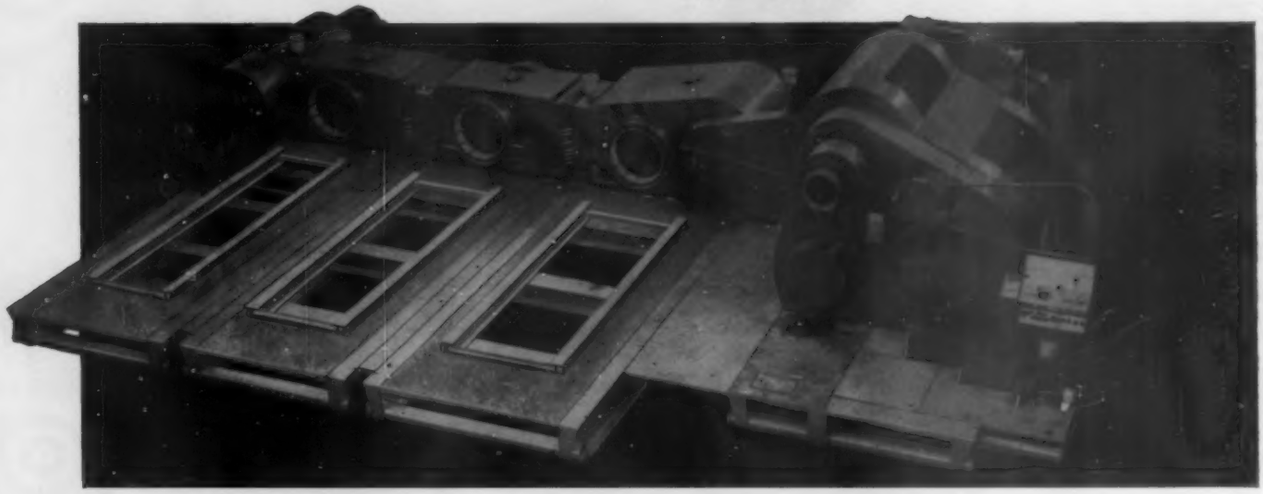

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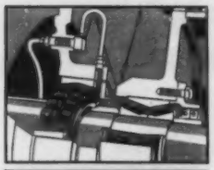

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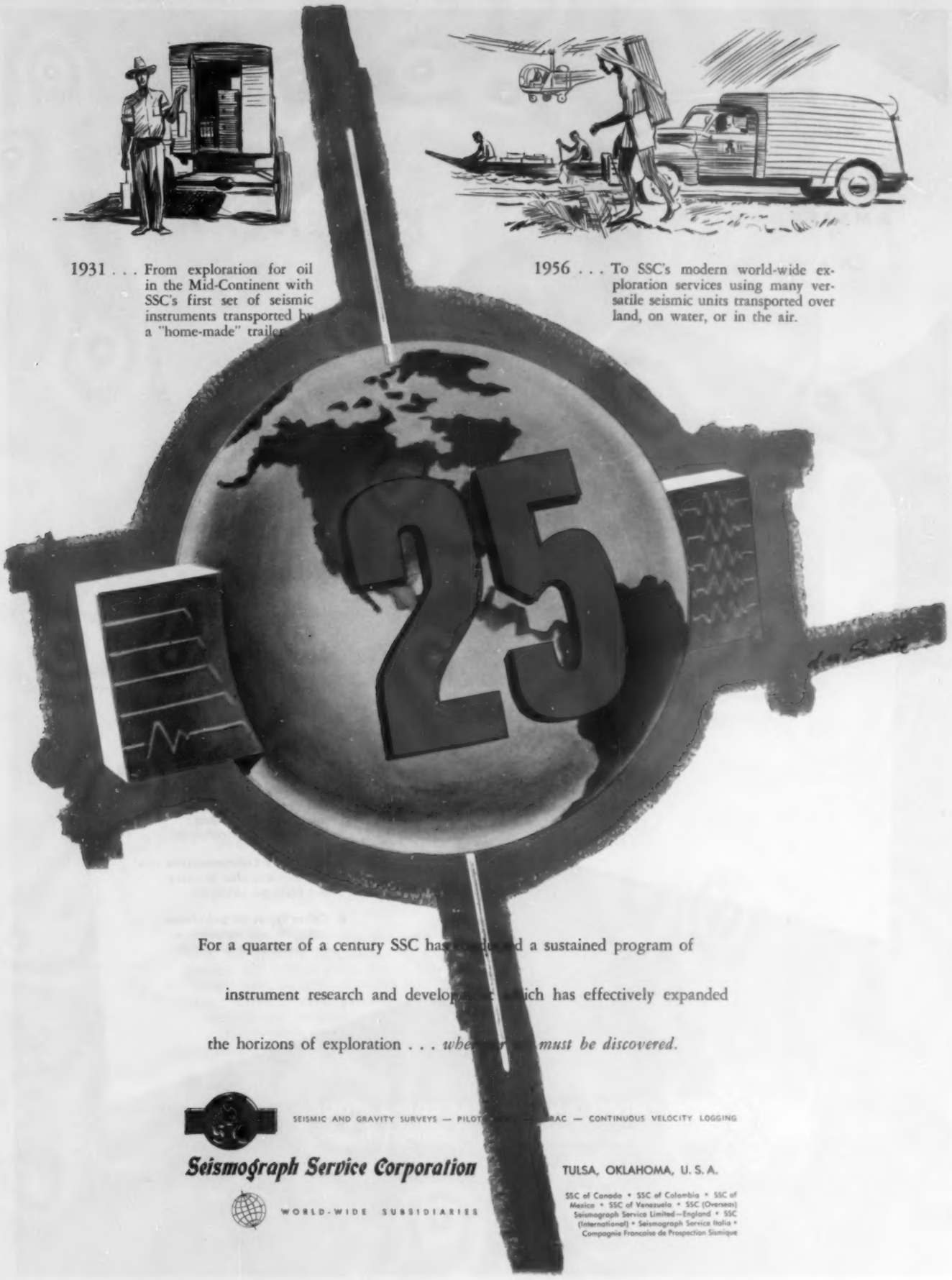


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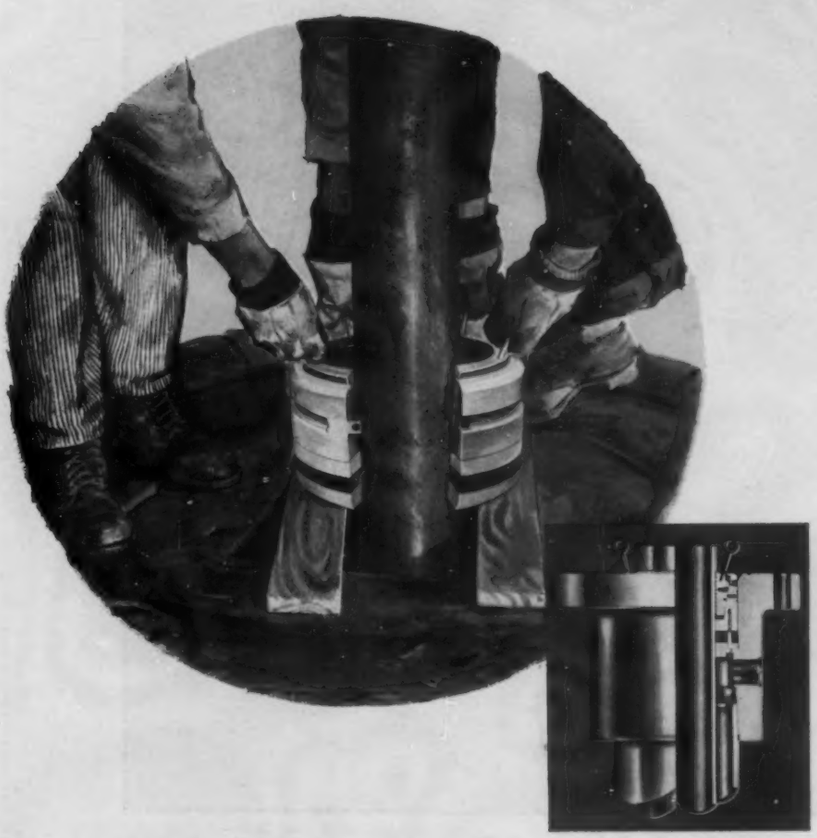

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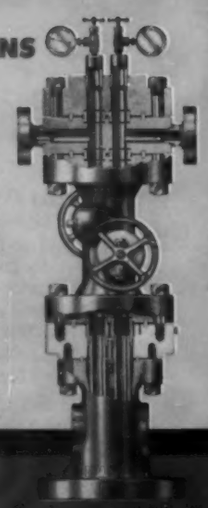

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